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ABSTRACT

This exploratory study was designed to describe young children's social interactions and teachers' perceptions before and after the introduction of a microcomputer to classrooms and early childhood settings in New Zealand. Two junior school classes and two kindergartens participated. During the first term of 1986, baseline data in the form of independent observation, teachers' diary records, and interviews of the children were collected. A Commodore 64 computer with age-appropriate software was introduced to each classroom or kindergarten in the second term. Data subsequently collected included coded observations, teachers' diary records, teacher and child interview data, and parents' written responses to an exploratory set of questions. An independent observer coded 28 randomly selected children's behaviors before and after the introduction of the computers. Findings tended to support the view that many young children perceive computers as fun, and that microcomputers can enhance aspects of children's social interactions. However, results also suggest that careful planning is needed before microcomputers are introduced to early childhood and junior school learning environments. Appendices provide summaries of teachers' courseware evaluations and instruments used in the study. (Author/RH)

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Evaluation of Exploratory Studies in Educational Computing

STUDY 9: THE IMPACT OF MICROCOMPUTERS ON TEACHERS AND ON THE OBSERVABLE BEHAVIOURS OF CHILDREN AGED FOUR TO SEVEN YEARS

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Evaluation of
Exploratory Studies in Educational Computing

STUDY 9: THE IMPACT OF MICROCOMPUTERS ON TEACHERS AND ON THE OBSERVABLE BEHAVIOURS OF CHILDREN AGED FOUR TO SEVEN YEARS

FINAL REPORT - 1989

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ABSTRACT

This exploratory study was designed to describe young children's social interactions and teachers' perceptions before and after the introduction of a microcomputer to classrooms and early childhood settings. Two junior school classes and two kindergartens participated. During Term 1 of 1986 baseline data were collected in the form of independent observations, teachers' diary records, and interviews of the children. A Commodore 64 computer with age appropriate software was introduced to each classroom or kindergarten in Term 2. Data collected post-computer included coded observations, teacher diary records, teacher and child interview data, and parents' written responses to an exploratory set of questions. The independent observer coded 28 randomly selected children's behaviour pre- and post-computer, using a modified version of Nida, Shade, and Watson's (1984) Guide for Coding Children's Social Behaviours. Inter-observer reliability correlations were satisfactory on most behavioural categories. Analyses of the observational data showed that both the kindergarten and the junior school children talked to their peers about the task more frequently post-computer. The children also asked their teachers for help more often after the introduction of the microcomputer. Individual differences were found on some behaviours, and case studies of four different children were presented. Overall no major differences were found between the boys' and girls' social behaviour. This report also describes the teachers', parents' and children's views on computers, discusses aspects of the children's motivation, and summarizes the teachers' reviews of the courseware used in the study. The results tend to support the view that many young children perceive computers as fun, and that microcomputers can enhance aspects of their social interactions. However, the study also suggests that careful planning is needed before microcomputers are introduced to early childhood and junior school learning environments.

TABLE OF CONTENTS

	Page
Abstract	iii
List of Tables	vi
Preface	vii
Acknowledgements	ix
INTRODUCTION	
Summary of Related Literature	1
Aims of the Study	5
METHOD	
Sample	6
The School and Kindergarten Samples	6
Sample for Child Observations	7
Equipment and Measures	8
Hardware	8
Software	8
Instrument for Coding Social Behaviours	8
Other Measures	11
Procedure	11
General Procedures and Time Frame	11
Observations of the Childrens' Social Interactions	12
Interviews of the Children	12
The Teachers' Perceptions	13
The Parents' Perceptions	13
Data Analysis Plan	14
RESULTS	
The Children's Perceptions	15
Observations of the Children's Social Behaviours	16
Descriptive and Multivariate Analyses	16
Behavioural Profiles of Individual Children	22
The Teachers' Perceptions	31
Perceptions of the Children's Social Interactions	31

Page

Views on Gender Differences among Children 33

Perceptions of the Children's Problem Solving 34

Views on Management Issues: 38

Pre-computer Phase: Inservice Training and Workload 38

Post-computer Phase: Classroom Organization and Workload 38

Advantages and Disadvantages of Computers 40

Perceptions regarding Parental Interest 41

The Parents' Perceptions 43

Parents' Views on having a Computer in the Classroom or Kindergarten 43

Parents' Familiarity with Computers 46

Parents' Views on having a Computer in the Home 49

DISCUSSION 53

References 57

Appendices

Appendix A Courseware Evaluations 59

Appendix B Instruments used in the Study 114

LIST OF TABLES

		Page
Table 1	Children's Perceptions Pre- and Post-computer of the Extent to which Computers are Fun	17
Table 2	Mean Percentages and Standard Deviations on the Children's Social Behaviours Pre- and Post-Computer	18
Table 3	Mean Percentage Scores on the Boys' and Girls' Social Behaviours Pre- and Post-Computer	19
Table 4	Mean Percentage Scores on the Kindergarten and Junior School Children's Behaviours Pre- and Post-Computer	20
Table 5	MANOVA: Pre- and Post-Computer (Term 1/Term 2) Differences in Social Behaviour	21
Table 6	MANOVA: Kindergarten versus Junior School Differences in Social Behaviour	22
Table 7	Parents' Views on having a Computer in the Kindergarten	44
Table 8	Parents' Views on having a Computer in the Classroom	45
Table 9	Parents' Views on having a Computer in the Classrooms and Kindergartens	46
Table 10	Percentages of Kindergarten Parents with a Computer in the Work Situation	47
Table 11	Percentages of Parents from the School Sample with a Computer in the Work Situation	48
Table 12	Percentages of Mothers and Fathers with a Computer in the Work Situation	48
Table 13	Percentages of Kindergarten Parents who would Feel Comfortable Using a Computer	50
Table 14	Percentages of Parents who would Feel Comfortable using a Computer (junior school sample)	50
Table 15	Percentages of Mothers and Fathers who would Feel Comfortable Using Computers	51
Table 16	Parents' Views on having a Computer in the Home	52

PREFACE

The Exploratory Studies in Educational Computing (ESEC) were set up at the request of, and funded by, the Minister of Education, following a new policy provision introduced in 1985. The purpose of the studies was to provide a basis for future policy developments in educational computing.

Initial proposals were sought in an advertisement in the *Education Gazette* of 14 June, 1985, and some 200 separate proposals from more than 100 schools were received. A broadly representative conference met at the Stella Maris Retreat Centre, Wellington, between 2-6 September, 1985 to consider the applications, and eventually 15 distinct studies for major funding were chosen. Subsequently two of these were subdivided, making 19 separate studies in all.

The Computers in Education Development Unit (CEDU), within the Department of Education, was responsible for the technical management and funding of the projects, and with the exception of one study, the New Zealand Council for Educational Research has been responsible for their evaluation. (One is being evaluated at the University of Auckland). Each study was co-ordinated and conducted by a committee consisting of the teachers involved (who were often, though not always, the originators of the study), one member from the CEDU, at least one member from the NZCER, and often others from the inspectorate, teachers colleges or regional resource centres.

Many of the proposals had requested specific computer equipment and software, and this was ordered and shipped to schools by the beginning of 1986. Classroom computer work commenced at various times during 1986, and proceeded through 1987. A variety of research materials were prepared for use as required by all the studies, including pre- and post-questionnaires for students and teachers, and logs and diaries to record day-to-day impressions. In addition, study-specific instruments were prepared where necessary. One of the studies was at the preschool level, four studies dealt with children with special needs. All of the remainder were located in primary schools, but some involved secondary school children.

The projects are distinctive in the way in which they have been initiated by classroom teachers, rather than by Departmental policy-makers or educational researchers. The level of commitment from all the teachers involved in the projects has consequently been very high. They responded positively to the opportunity to participate, and contributed many hours of extra work to the evaluative aspects of the studies.

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The work of Paul Vincent from CEDU Department of Education Wellington is acknowledged gratefully. Garry Frater provided local Department of Education oversight. We would also like to thank officers of the Early Childhood Division of the Department of Education, especially Caryl-Louise Robinson and Rachel Barrett-Douglas.

We acknowledge the Waikato Kindergarten Association for their co-operation with liaison. During her time as a Senior Teacher, Georgina Kerr also offered support to the kindergarten teachers.

Colleagues from NZCER have been helpful. Dr. Anne Meade was actively involved in the research during its earliest phases. Dr. David Atmore contributed substantially to the data management and analysis. Danny Ashworth coded the children's interview data.

Valerie N. Podmore

Barbara H. Craig

April 1989

1: INTRODUCTION

Summary of Related Literature

For some years now, researchers and educators have been discussing the implications of introducing microcomputers into early educational settings. Some writers have expressed concern that young children using microcomputers might interact less frequently with their peers. Others are enthusiastic about young children's potential to interact co-operatively while using microcomputers. Views have also differed on the 'holding power' of computers and the extent to which young children enjoy computer-related activities.

Several writers have made anecdotal comments about the motivating effects of computers, and have suggested strategies to make computing activities more motivating for young children (e.g. Ball & Salinger, 1986). According to Papert (1980), computers are generally motivating and have 'holding power' for children.

As Gottfried (1985) has pointed out, researchers and theorists usually think of children's academic intrinsic motivation in terms of enjoyable learning processes, or of challenge, curiosity, learner persistence, or high involvement in the task. In the case of computing tasks, some researchers are now questioning Papert's (1980) assumptions and are stressing the need to look more specifically at different children's perceptions and at the various dimensions of motivation.

For example Williams and Beeson (1987), who observed 33 children's choices of activities in an early childhood education centre in the USA, found that overall the children chose to work at puzzles and bristle blocks significantly more frequently than at a computer. These researchers reported substantial individual differences in the time children spent at the computer. As a result of the wide variations found in the young children's choice of a persistence at computing tasks, Williams and Beeson warned against making broad generalizations about the 'holding power' of computers.

In Britain, Smith and Keep (1986) interviewed 132 children 6 to 14 years about their opinions of educational software, and reported that the children actively made decisions about software evaluation and about the computer-related activities they found exciting. Smith and Keep stressed

that, before making assumptions about the motivating properties of computers, researchers need to consult individual children about their opinions on pleasurable aspects of computing.

In contrast with the individualistic emphasis of intrinsic motivation (see Spence, 1984), researchers and educators are also concerned with social interactive and co-operative aspects of early childhood computing. In 1983, Barnes and Hill questioned whether microcomputers would isolate children and restrict their social and language development. Soon after their article was published, a number of other writers reported that young children using microcomputers in primary or pre-school settings were interacting frequently and co-operatively with their peers (e.g., Spencer and Baskin, 1983). Consequently Hill has since noted that 'co-operative ability, socialization, and increased questioning appear to emerge when children work with computers' and that 'perhaps this relates to children's general attitudes towards computers: they like them.' (Hill, 1985, p.18)

To date, only a few research studies have described young children's actual interactions with their peers when using a computer. Much writing on the topic has been based on informal impressions rather than on systematic observation.

Nida, Lipinski, Shade, and Watson (1984) have reported two systematic small-scale experiments. These researchers investigated the social interactions of 4-year-old children before and after the introduction of a microcomputer to a university nursery school (Study 1) and a university daycare centre (Study 2). Nida et al trained four observers to code children's pro-social, anti-social, and neutral behaviours, using a 12-category observational schedule. Baseline observations were made before an Apple 11e microcomputer and 'Sticky Bear' software were introduced to each of the pre-school settings. In Study 1 observations were also made immediately after introducing the computer but before the keyboard was operating. As the children appeared frustrated by this computer - noninteractive phase, it was omitted in Study 2. In both studies, observations continued through two further treatment weeks: computer interactive (computer operating, observer not interacting with children) and computer-interactive/teacher-interactive (computer operating, observer helping children use new software). When the children's interactions were compared across activities, both Study 1 and Study 2 showed that more verbalizations occurred between children during dramatic play than during art. Nida et al also reported that introducing the microcomputer did not lead to social isolation, but at the same time, social interaction did not occur significantly more often at the computer than at

other play areas. Low levels of aggression were observed in both studies. In Study 2 there was an increase in aggression in the computer area during Week 2 when 22 children were competing for a turn, but this diminished in Week 2 when the teacher became active in assisting the children. Consequently the authors recommended a low ratio of children per computer, and high teacher involvement to enhance learning and turn-taking at the computer.

A study by Muller and Perlmutter (1985) has shown similarly that social isolation effects do not occur when pre-school aged children use computers. These researchers compared children's interactions while they were working on a computer and while they solved jigsaw puzzles. The children, aged 4 and 5 years, frequently worked with a peer when at the computer (63% of the time there). Much of their interaction at the computer focused on active sharing and turn taking (70% of their interactions). When a subset of the children was observed at jigsaw puzzles, they worked with peers only 7% of the time. In contrast with their behaviour at the computer, there was no turn taking at the puzzles and the most frequent form of interaction (64%) was verbal explanations.

One or two other studies have also shown that young children's social interactions do not decrease during computing activities. In another observational study in the U.S., Klinzing and Hall (1985) recorded the behaviour of 32 children who attended a university pre-school. Two classes of children were involved, one of 4 year-olds and one of 5-year-olds. The children were observed at 9 different activity stations. Activities included those typical of pre-schools like art, blocks, housekeeping, language, cooking/science, and manipulative activities, and also two different microcomputers with age-appropriate software. The children's type of play behaviour was recorded on Parten's Play Classifications and their verbal interactions at each activity were coded on Flanders' Interaction Analysis Scale. Findings suggested that the computer activities were associated with co-operative and independent play. In the 4-year-olds' class, 76.2% of all praise used was recorded at the computer; but praise occurred much less frequently around the computer in the 5-year-olds' class (13.3%), where the equipment was less novel.

Overall then, recent observational studies in the U.S. are tending to suggest that children's social interactions and use of language are not diminished by the presence of microcomputers in early childhood centres. However, as Klinzing and Hall (1985) suggest, more research is needed to determine whether microcomputers have a positive influence in different types of pre-schools.

A number of researchers and teachers are also concerned about equity of access to computing experiences, and child gender has been a specific focus of several computing studies with young children. Conflicting results have been reported. Beeson and Williams (1983) found, for example, that girls aged under 5 years (45 to 59 months) selected the computer as an activity significantly less frequently than boys of the same age, but there was no statistically significant gender difference among children aged over 5 years (60 to 67 months). These age trends were contrary to the expectations of the researchers, who recommended that further research should be undertaken. In contrast, Johnson (1985) reported that 20 children (mean age = 49 months) observed in a university pre-school showed no significant gender differences either in their use of computers or their interest in them. Clearly, child gender needs to be controlled in studies of young children and computers. There is also a need to investigate gender differences in children's use of, interactions at, and attitudes towards computers.

Another area of concern to early childhood educators is the management of microcomputers in kindergartens and classrooms. Carmichael, Burnett, Higginson, Moore, and Pollard (1985), who conducted a multisite (Kindergarten to Grade 8) Canadian study of educational computing, reported that physical arrangements in the classroom were a source of concern for many teachers. Several early childhood educators and researchers in Australia have commented that there is a need for careful planning by teachers when microcomputers are introduced to early childhood centres (see Swift, 1985). For example, Tan (1985) has recommended that researchers and teachers should determine what teachers and parents need to know about computers so that they can facilitate young children's development and learning. In New Zealand, Gibbs (1984) has pointed out that planning by teachers is essential, and that there is a dearth of good software available for young children.

The present exploratory evaluation of microcomputers in kindergartens and junior classrooms is concerned with both social interaction and management issues. Teachers' experiences and recommendations are an important part of the research.

Aims of the Study

This study aimed to examine the social interaction aspect of introducing microcomputers into kindergarten and a junior primary school environment. A second aim was to describe the teachers' perceptions concerning the impact of the new technology.

A major research objective was to assess how a microcomputer enhances social interaction in the learning environment of a kindergarten or a junior class. The research was designed specifically:

1. To record selected children's social behaviours before and after the introduction of a microcomputer to the classroom.

2. To assess individual differences and group differences in children's use of the computer.

3. To determine the impact of the new technology upon teachers' workloads and their time management.

4. To note the expressed concerns or enthusiasm of parents about having a computer in the kindergarten or junior class and to comment on any changes in parental involvement.

2: METHOD

Sample

The School and Kindergarten Samples

Two junior classes from a primary school and two kindergartens participated. The school and the kindergartens were located within a few kilometres of one another in a medium-sized New Zealand city. The teachers described the community as mixed in terms of SES, with some state housing and rental accommodation, some 'first home' ownership, and some 'top priced' housing. Pakeha children and some Maori or Samoan children attend the school and kindergartens. A few children from a number of other ethnic minority groups are also on the school roll.

Kindergarten A was built 7 years ago. About 40 children are on the morning roll, and the average morning attendance is about 37 or 38. The staffing was stable during 1986, with the same three teachers throughout the year the microcomputer was introduced. The head teacher changed in 1987. The kindergarten philosophy was outlined as: 'Child-centered programme with emphasis on developing children's own creativity. Belief in the need to develop children's self-esteem.'

Kindergarten B was established 30 years ago. The number of children on the morning roll reached 40 by the end of 1986, and the turnover of children was described as low. The same two teachers remained at the kindergarten throughout the study. The kindergarten philosophy emphasises children developing independence. 'We endeavour to create an environment in which children will hopefully grow in independence. We provide activities to assist this.'

The primary school has also been open for 30 years. Both junior class teachers arrived at the school in February 1986 and both remained on the staff during 1986 and 1987. Six children left one of the junior school classes during 1986. Both classes have about 30 pupils on the roll.

One of the junior school teachers described her philosphy this way 'My main objective is to promote independence...Children are encouraged to solve their own problems. I'm the 'advisor' or the 'last resort'. I expect every

child to do their best to co-operate and consider others, including myself. The same is expected of myself!'

The other junior school teacher outlined her expectations of the children as 'Academic: that children will develop and progress according to their own individual abilities. Social: that children will learn to mix with others, share things, and problem solve during the school day.'

At any one time during the study, approximately 140 children participated, about 30 in each of the junior school classes and around 40 children at each of the kindergartens.

Overall, the children came from a range of socio-economic backgrounds. Their fathers' occupations, coded on the Elley and Irving (1985) Scale, ranged from 1 to 6, with a substantial number (N = 66, 46%) in the middle at levels 3 and 4. Many of the mothers were not working (N = 107, 71%) and the occupational status of those who worked ranged from 1 to 6 on the Irving and Elley (1977) scale.

The ethnic group of most children was described as Pakeha (New Zealand European) (N = 107, 74.3%), or Maori (N = 23, 16.0%). A few children from other ethnic minority groups attended the school. The majority of children came from households with two adults in residence, and from families with two or three children.

Sample for Child Observations

A smaller sample of children was selected for observation. Observational data were obtained for 28 children, 14 girls and 14 boys. Half of the children attended the two kindergartens, the other half were in one of the two junior school classes. The children were selected according to birthdates as recorded on the rolls. The kindergarten children initially selected were the 16 4-year-olds whose fourth birthdates were closest to 30 March 1986, and the junior class children the 16 6-year-olds whose sixth birthdays were closest to 30 March 1986. Absences from class or moving from the district reduced the final sample from 32 to 28 children.

The 28 children came from a range of socio-economic backgrounds. Their fathers' occupations coded on the Elley and Irving (1985) scale, ranged from 1 to 5 (with no-one at level 6, and one response uncodable). Occupations of the 6 mothers who were working ranged from 1 to 4 on the Irving and Elley (1977) scale, and 20 (71.43%) of the mothers were described as housewives. Two of the children came from one-parent families.

Most of the children were described as Pakeha (N = 22, 78.57%) or Maori (N = 4, 14.29%). The remaining two children were Indian.

Equipment and Measures

Hardware

The hardware provided by the Department of Education included one Commodore 64 microcomputer, one colour monitor, one single disk drive, and one joystick for each of the two junior school classes and each of the two kindergartens. In addition, the school and each of the kindergartens was equipped with one Star SG10 printer with Commodore interface. The computers used did not have an autostart facility.

Software

The teachers and the resource person selected age-appropriate software for each site. Software provided for the two kindergartens included Alpha Build, Memory Manor, Kindercomp, Facemaker, Micro Illustrator, Sticky Bear Numbers, Sticky Bear Opposites, Donald Duck's Playground, Big Bird's Special Delivery, Print Shop, and Print Shop Extra Graphic Disc No. 2. The junior school classes used Alpha Build, Sea Speller, Sticky Bear Shapes, Sticky Bear Reading, Stickers, Make a Match, Tally and Total, Write Now, Corner Store, Moving Pictures, Micro Illustrator, Getting Ready to Read and Add, Boppies Great Word Chase, Print Shop, Print Shop Extra Graphic Disc No. 1, and Muppet Learning Keys.

Instrument for Coding Social Behaviours

An adapted version of Nida, Lipinski, Shade, and Watson's (1984) social behaviour categories was used to code the children's prosocial and antisocial behaviour and their verbal interactions. The 12 categories of behaviour used in this study are outlined below, with examples drawn from trialling observations in the Wellington region.

Prosocial Behaviour

1. Co-operation/Helping/Sharing: Child co-operates with another child;

child helps or shares with a child or an adult.
Examples: Child is operating the joystick while a peer is pointing to the screen. They are working together towards achieving a goal on the screen display (Co-operation). Child says 'You can have this piece' and offers lego piece to peer (Sharing/Helping).

2. Praise: Gestures of physical affection (hugs, embrace) or verbal praise.
Examples: 'Good - you did it', 'thanks for giving me a turn', 'You're good at this' (hugs peer).

3. Initiating Social Interaction: Child attempts to initiate social interaction with child.
Examples: Child approaches another and states, 'look at mine - mine's a knock out.' Child asks peer 'Why is it (screen display) doing this?' (talk that continues after the initiation is scored under other categories).

Antisocial Behaviour

4. Physical/Verbal Aggression: Physical or verbal aggression directed toward a person. Includes hitting, banging, kicking another person and name calling, teasing, angry talk to another, exclusion of peer from play.
Examples: 'Get out of my way' (angry tone) 'Boy you're not allowed here' (angry tone).

5. Non-verbal/Object Aggression: Child damages objects or activities. Includes interference with another child's activity, or banging, hitting, or throwing objects.
Examples: Child throws blocks (apparently aimlessly) across the floor. Child grabs the joystick from peer.

Neutral Behaviours

6. Asking Adult for Help: Child asks an adult for help with something.
Example: 'How do you move it?' (points to screen).

7. Looking at/Manipulating Equipment: Child is looking at equipment or

physically manipulating materials.
Examples: Child moves joystick with right hand, and looks at the screen.

8. Verbalization Towards Adult - Task: Child talks to an adult or teacher about the task, but child is not asking for help.
Examples: 'Look what I made'
'I like this one' (points to screen).

9. Verbalization Towards Adult - Non Task: Child talks to an adult or teacher, but not about the task.
Example: 'I've got a new baby sister.'

10. Verbalization Towards Child - Task: Child talks to another child about the screen display or the activity.
Examples: 'It's moving over that way now' (points to screen)
'The puzzle's all finished now'.

11. Verbalization Towards Child - Non Task: Child is talking to peer. Child's verbalization is not related to the task at hand.
Example: 'Soon it's going to be lunchtime.'

12. Moving/Attending/Receiving. Child is not engaged in any other behaviour throughout the 10-second observation period. Child is moving from one activity to another; child is watching or listening to an adult or another child; child is receiving verbal or non-verbal communication from another person.
Examples: Child is listening to the teachers' instructions (but child is not talking, or looking at screen or equipment). Child is moving from the swing to the tricycle.

An independent observer undertook all the observations at the school and the two kindergartens. Inter-observer reliability checks were made on about 15% of the total observations. Sufficiently high correlations ($r = .81 - 1.00$, $p < .001$) were found for all categories except Initiating Social Interaction ($r = .60$).

Other Measures

Other measures used in the study were brief pupil interview schedules; teacher questionnaires, diaries, and interview schedules; and a short set of questions for parents. The kindergarten teachers also recorded information about the children's use of the computer during the observational phase of the study.

Procedure

General Procedures and Time Frame

The study was divided into three main phases: pre-treatment or baseline (Term 1, 1986), post-treatment or computer-interactive (Terms 2 and 3, 1986), and a final phase of software evaluation (1987). Prior to the commencement of the study, the teachers, observers, and resource people met to clarify the research aims and to finalize the research proposal, and to develop the focus of the teacher diaries and independent observations. They also completed a pre-questionnaire about computing experiences and knowledge and background information. The observational instrument was trialled in Wellington at a kindergarten, in a junior school class, and while observing children using age appropriate software at a home computer.

During the pre-treatment phase, the teachers commenced courses in microcomputing at Teachers College, and they began keeping diary records. The independent observer was trained in using the observational categories and an electronic timer. Baseline observations of the 28 selected children were made in the kindergartens and junior school classrooms. All of the children were interviewed.

The post-treatment phase commenced with the introduction of the microcomputer to the learning environment. Teachers continued their diary records, and after a 2-week settling-in period (requested by the teachers to enable them to develop management strategies), post-computer observations of the children commenced. These observations continued throughout Term 2. Inter-observer reliability checks were made at regular intervals. The teachers and all of the children were interviewed at the end of Term 3.

In 1987 the teachers attended several all-day meetings to review the courseware used by the children. When evaluating the courseware they wrote comments about their experiences and they completed the CCDU Review of Educational Computer Courseware form (see Appendix B).

Observations of the Children's Social Interactions

During the pre-treatment phase, each selected child was observed at activities inside the kindergarten or at developmental activities in the classroom. The activities included play dough, jigsaw puzzles, lego, drawing, collage, construction, and painting. Each child was observed for a minimum of three 5 - minute intervals over three separate days.

In the post-treatment phase, the children were observed mainly at the microcomputer, again for a minimum time-span of three 5-minute intervals over three separate days.

The number of times each child was observed in the pre-computer period ranged from 3 to 6 (a duration of 15 to 30 minutes), and in the post-computer period the range was 3 to 10 times (15 to 50 minutes). The total number of times each child was observed ranged from 9 to 16 (45 to 80 minutes), with a mean of 12.25 (61.25 minutes).

The observer rotated her visits to the school and the two kindergartens. On each data collecting visit, she observed each of the selected children in rotation, noting absences. An electronic timing device was used when coding the observations. The child was observed for 10 seconds, then his or her behaviour was coded during the next 10-second interval, repeatedly for the duration of the coding sheet. Each coding sheet covered a total of 5 minutes' observation. The child's activity and the number of the children at the activity centre was also noted, and some examples of the children's behaviours were recorded.

A Guide for Coding Children's Social Behaviours, and a set of guidelines for the reliability observations, were prepared for the observers. The need to minimize observer conspicuousness was emphasised in the guidelines.

Interviews of the Children

Biographical information about the children and their families was obtained from their parents and from school and kindergarten records. This information was then recorded on the child interview schedules. The children were also interviewed individually by the teacher or a familiar adult. In the interviews conducted before the introduction of the microcomputers to the classroom or kindergarten, the children were asked about their previous use of computers and about whether computers are fun. The second interview, conducted two terms after the computers were introduced to the classrooms,

focused again on whether computers were fun and also on what aspects of computing the children liked and disliked.

The Teachers' Perceptions

Information about the teachers' perceptions of the impact of the new technology was collected in the form of diary records before, during, and after the introduction of the microcomputer. The diaries were structured to include specific topics. Before the computer was brought into the classroom or kindergarten, diary entries focused on the teacher's workload when preparing for the computer, the manuals and documentation, and the effects of having an observer in the classroom or kindergarten. After the computer had been introduced, the diary topics included the children (their help seeking, difficulties, perseverance, and enthusiasm), the impact on the teacher's workload, classroom organization, and the parents' involvement.

When the computer had been in the classroom or kindergarten for two terms, the teachers were interviewed. The interviews were conducted individually in a private office, and tape recordings of the interviews were later transcribed. Interview questions were concerned with parental involvement, experiences with software, perceptions of children's social interactions, organization and management concerns, and the advantages and disadvantages of having a computer in the classroom or kindergarten.

The Parents' Perceptions

As the teachers were interested in the parents' reactions to having a microcomputer in the kindergartens and junior classes, they participated in writing out a short set of questions for parents. The brief forms that were developed and sent home with each child included these questions:

> What do you think about having a computer in your child's classroom/kindergarten?
>
> Do you have a computer in your work situation?
>
> Would you feel comfortable using a computer?
>
> If you were able to have a computer in the home, how would you feel about it?

The forms were sent home in December 1986, after the microcomputers had been in the kindergartens and classrooms for two complete school terms. Forms were

supplied for every parent (or grandparent or 'other adult') and the overall response rate was estimated to be 86.86% (80% at one kindergarten, 92.5% at the other, and 90% for the two junior school classes). This procedure was essentially an exploratory exercise.

Data Analysis Plan

Both the coded data from the pre- and post-computer interviews with the children and the observation data were analysed by computer using SAS. After computing descriptive statistics on the observational data, univariate analyses of variance were used to examine pre- and post-computer differences and group differences in the children's social behaviours.

3: RESULTS

The Children's Perceptions

The children's responses about the extent to which computers are fun are summarized in Table 1. Both before and after the computer was introduced to the kindergartens and classrooms, many children perceived computers as being quite a lot of fun. When the pre- and post-data were compared, a slightly larger number of children thought computers were fun post-computer (N = 125, 82.8%) than pre-computer (N = 105, 72.9%); and a slightly smaller number of children found computers no fun at all post-computer (N = 6, 4%) than pre-computer (N = 11, 7.7%). However, subsequent Chi Square analyses showed that these pre- and post-computer differences were non-significant. There were no major differences in the responses of the school-aged versus the kindergarten-aged children.

During the post-computer interviews, the children expressed some specific likes and dislikes regarding computers. In response to the question 'What do you like about computers?' many children named or described software (N = 76, 50%). Others specified software-related activities like graphics, music, playing, or working (N = 56, 37%), and a few mentioned technical or manipulative details like using the joystick (N = 7, 5%). Only one child, a girl at one of the kindergartens, replied that she liked 'nothing' and disliked 'everything' about computers. When probed, 'What else do you like about computers?', a number of children again named specific software (N = 36, 24%) or technical details (N = 36, 24%), and a few children (N = 7, 5%) mentioned social interactive or motivational aspects including 'I like the teacher helping me with it' (kindergarten girl), and 'because it's good fun' (kindergarten boy).

Software packages most frequently mentioned by the kindergarten children as something they liked about computers were Facemaker, Big Bird's Special Delivery, and Early Games. The junior school children most frequently named Alpha Build, Muppet Learning Keys, and Sticky Bears (shapes and reading) as software-related 'likes'.

When asked whether there was anything they disliked about computers, many children replied in the negative (N = 109, 72.2%), but some did have 'dislikes' (N = 33, 21.9%). Those who expressed dislikes tended to specify social interactive or motivational details like 'I don't like being pushed

off' (kindergarten girl), 'I get tired of working it' (kindergarten boy), 'I don't like the hard games' (junior school boy) (N = 9, 6%); actual software (N = 11, 7%); or software related activities (N = 7, 5%).

Finally, the children who had computers at home (N = 19, 113%) were asked what they liked doing on the home computer. Again, most named software or mentioned software-related activities like drawing or playing.

Observations of the Children's Social Behaviours

Descriptive and Multivariate Analyses

Mean percentages and standard deviations on the children's social behaviours, both pre- and post-computer, are presented in Table 2. Looking at/Manipulating Equipment was the most frequently occurring behaviour, accounting for 64.61% of the children's interactions before the computer was introduced, and 57% after the computer was present in the classrooms and kindergartens.

There was certainly no overall decrease in the percentage of time spent interacting with peers after the computer was introduced. Table 2 shows that the behaviour Verbalization to Child-Task increased from 11.52% of the behaviour pre-computer to 18.11% of the behaviour post-computer. All forms of aggression occurred relatively rarely before and after the computer was introduced, and only a few individual children used aggressive behaviours.

Mean percentages are presented separately for boys and girls in Table 3. Girls in particular seemed to be talking to peers about the task more after the computer was introduced. The mean percentage of Verbalization to Child-Task for girls was 9.25 pre-computer, and 18.46 post-computer.

The data for the kindergarten and junior school samples are shown separately in Table 4. Overall, similar trends are apparent for both age groups. The mean percentage of Verbalization to Child-Task changed among the junior school children from 11.09 pre-computer to 20.28 post-computer.

Table 1

Children's Perceptions Pre- and Post-Computer of the Extent to which Computers are Fun

Response	Pre-computer[a] N	%	Post-computer[b] N	%
Quite a lot of fun	105	72.9	125	82.8
Not very much fun	15	10.4	11	7.3
No fun at all	11	7.7	6	4.0
Ambiguous, no response	13	9.9	9	5.9

Note:

a N = 144

b N = 151

Large standard deviations in relation to the mean scores can be seen on some behaviours, notably Co-operation, Praise, Initiating Social Interaction, both Physical/Verbal and Non-verbal/Object Aggression, Talking to Adult-Non task, and Moving/Attending/Receiving (see Table 2). This suggests the need for further analysis of individual differences in behaviour.

The effects of term (pre- and post-computer), sex and class (kindergarten or junior school) on the children's social behaviours were examined further using MANOVA. In the pre- and post-computer analyses, the ANOVA F tests were significant for several behaviours (see Table 5). The behaviour Verbalization towards Child-Task increased significantly in the post-computer observations ($F = 14.98$, $p < .001$). The behaviour Asking Adult for Help also occurred more frequently post-computer ($F = 10.66$, $p < .01$). Looking at/Manipulating Equipment occurred less frequently post-computer.

Table 2

Mean Percentages and Standard Deviations on the Children's Social Behaviours Pre- and Post-Computer

Social Behaviour	Pre-computer[a] M[c]	S.D.	Post-computer[b] M[d]	S.D.
Co-operation/Helping/Sharing	3.17	4.28	5.45	3.49
Praise	.47	.88	.08	.28
Initiating Social Interaction	.36	.63	.72	.72
Physical/Verbal Aggression	.30	.79	.56	1.10
Non verbal/Object Aggression	.22	.71	.18	.48
Asking Adult for Help	.12	.35	1.19	1.71
Looking at/Manipulating Equipment	64.61	10.53	57.00	7.17
Verbalization to Adult-Task	2.33	2.67	3.73	3.94
Verbalization to Adult-Non task	.69	1.04	.51	.74
Verbalization to Child-Task	11.52	6.04	18.11	6.73
Verbalization to Child-Non task	2.61	2.46	1.52	1.57
Moving/Attending/Receiving	13.61	9.70	10.94	6.07

Note: N = 28

a Term 1, before the introduction of the microcomputer to the classroom/kindergarten

b Term 2, after the introduction of the microcomputer to the classroom/kindergarten

c Mean percentage of total behaviour observed in Term 1 (pre-computer)

d Mean percentage of total behaviour observed in Term 2 (post-computer)

Table 3

Mean Percentage Scores on the Boys' and Girls' Social Behaviours Pre- and Post-Computer

Social Behaviour	Pre-computer[a]		Post-computer[b]	
	Boys	Girls	Boys	Girls
	M %	M %	M %	M %
Co-operation/Helping/Sharing	4.65	1.69	5.21	5.69
Praise	.54	.39	-	.17
Initiating Social Interaction	.46	.26	.64	.80
Physical/Verbal Aggression	.20	.39	.76	.36
Non verbal/Object Aggression	.30	.13	.28	.07
Asking Adult for Help	.17	.06	1.31	1.06
Looking at/Manipulating Equipment	62.85	66.38	57.02	56.98
Verbalization to Adult-Task	2.35	2.30	4.15	3.32
Verbalization to Adult-Non task	.46	.92	.62	.41
Verbalization to Child-Task	13.79	9.25	17.76	18.46
Verbalization to Child-Non task	2.14	3.08	1.83	1.21
Moving/Attending/Receiving	12.08	15.14	10.41	11.47

Note: Boys N = 14, Girls N = 14. Dashes indicate zero frequency

a Term 1, before the introduction of the microcomputer to the classroom/kindergarten

b Term 2, after the introduction of the microcomputer to the classroom/kindergarten

Table 4

Mean Percentage Scores on the Kindergarten and Junior School Children's Behaviours Pre- and Post-Computer

Social Behaviour	Pre-computer[a]		Post-computer[b]	
	Junior School	Kindergarten	Junior School	Kindergarten
	M %	M %	M %	M %
Co-operation/Helping/ Sharing	3.72	2.62	5.74	5.17
Praise	.51	.42	.13	.03
Initiating Social Interaction	.25	.47	.45	.99
Physical/Verbal Aggression	.13	.46	.61	.51
Non verbal/Object Aggression	.44	-	.21	.14
Asking Adult for Help	.13	.10	.69	1.69
Looking at/Manipulating Equipment	69.13	60.09	57.49	56.51
Verbalization to Adult-Task	1.94	2.72	1.38	6.09
Verbalization to Adult-Non task	.26	1.13	.43	.60
Verbalization to Child-Task	11.09	11.94	20.28	15.94
Verbalization to Child-Non task	3.29	1.93	1.36	1.68
Moving/Attending/ Receiving	9.11	18.11	11.22	10.66

Note: Kindergarten children N = 14, junior school children N = 14.

a Term 1, before the introduction of the microcomputer to the classroom/kindergarten.

b Term 2, after the introduction of the microcomputer to the classroom/kindergarten.

No statistically significant differences in behaviour were found in the child gender analyses. However, class (kindergarten versus junior school) was associated with some differences in behaviour (see Table 6). Verbalization to Adult-Task occurred more frequently among the younger kindergarten children ($F = 10.89$, $p < .01$).

None of the findings significant at $p < .01$ occurred on the behaviours with the large standards deviations.

Table 5

MANOVA: Pre- and Post-Computer (Term 1 /Term 2) Differences in Social Behaviour

Social Behaviour	ANOVA SS	F[a]
Co-operation/Sharing/Helping	72.78	4.78
Praise	2.07	4.70
Initiating Social Interaction	1.83	4.16
Physical/Verbal Aggression	1.00	1.05
Non-verbal/Object Aggression	.02	.07
Asking Adult for Help	16.06	10.66*
Looking at/Manipulating Equipment	811.32	10.58*
Verbalization to Adult - Task	27.73	2.87
Verbalization to Adult - Non task	.46	.60
Verbalization to Child - Task	609.09	14.98**
Verbalization to Child - Non task	16.67	3.82
Moving/Attending/Receiving	99.89	1.61

Note: Pre-computer N = 28, Post-computer N = 28
a df = 1
ANOVA F values are significant at:
* $p < .01$
** $p < .001$

Table 6

MANOVA: Kindergarten versus Junior School Differences in Social Behaviour

Social Behaviour	ANOVA SS	F[a]
Co-operation/Sharing/Helping	9.79	.64
Praise	.13	.29
Initiating Social Interaction	2.00	4.50
Physical/Verbal Aggression	.18	.19
Non-verbal/Object Aggression	.91	2.56
Asking Adult for Help	3.28	2.18
Looking at/Manipulating Equipment	351.26	4.58
Verbalization to Adult - Task	105.28	10.89*
Verbalization to Adult - Non task	3.85	5.00
Verbalization to Child - Task	42.68	1.05
Verbalization to Child - Non task	3.75	.86
Moving/Attending/Receiving	249.10	4.01

Note: Kindergarten children N = 14, Junior School children N = 14
a df = 1
ANOVA F values are significant at:
* p < .01

Behavioural Profiles of Individual Children

In addition to the analyses of group pre- and post-computer differences in behaviour, case studies were compiled for each child. Individual profiles are presented here on four children. These four were selected from among the total 28 target children, using random number tables (Arkin & Colton, 1963). A random stratified procedure was adopted to ensure that girls and boys, Maori and Pakeha, and kindergarten and junior school children were included. In this report, a fictitious first name is used for each of the four children. The teachers wrote descriptive comments about the target children in December 1986, and these notes are quoted in the individual profiles.

Michael, a 4-year-old boy attending one of the kindergartens is described by his teacher as a 'quiet child, shy, sometimes sly'. He is 'inept at social contact', will 'often hit out or do the wrong thing' at kindergarten, and he is 'fairly protected' by his parents. Michael is the younger of two boys, both of whom the teacher considers have 'limited experience' with 'lots of restrictions at home'. He is identified as European/Pakeha, is in good health, and he attends the kindergarten regularly.

The teacher described Michael's behaviour at the computer as that of a 'follower'. He 'followed his friend to the computer, followed his guidance, and learnt quite a bit this way. He became quite proficient at the computer, but would leave once (his friend) did.' The teacher noted that Michael also 'copied others with drawing and painting and other social activities'.

Michael was interviewed before and after the computer was introduced to the kindergarten. On both occasions, when asked by the interviewer, 'Are computers Quite a lot of fun, or Not very much fun, or No fun at all?', Michael's response was, 'Quite a lot of fun'. When asked at the final interview what he liked doing on the computer, his responses were 'playing with the joystick' and 'pressing buttons'. He had no 'dislikes' about computers, and did not have a computer at home.

Michael's behaviour was recorded on 16 separate occasions during a time span of just over 4 months. These observations showed that he spent much of his time, both pre- and post-computer, Looking at/Manipulating Equipment. The behaviour Verbalization to Child about the Task was observed both pre- and post-computer, with no apparent increase post-computer. Unlike the other 27 target children, Michael was not observed Co-operating/Helping/Sharing either before or after the introduction of the computer (see Figure 1). However, despite the very low incidence of prosocial behaviour, no aggressive antisocial behaviour was recorded for Michael.

In this case, there seems to be considerable consistency between the teacher's description of Michael as 'socially inept' and his lack of Co-operational Helping/Sharing behaviour. This child perceives computers as fun because of their manipulative functions (the joystick and the keys). In line with his reasoning, the recorded observations showed that Michael frequently looked at or manipulated equipment. There was no decrease in his talking to peers about the task post-computer, but this behaviour was not noticeably enhanced after the computer was installed in the kindergarten.

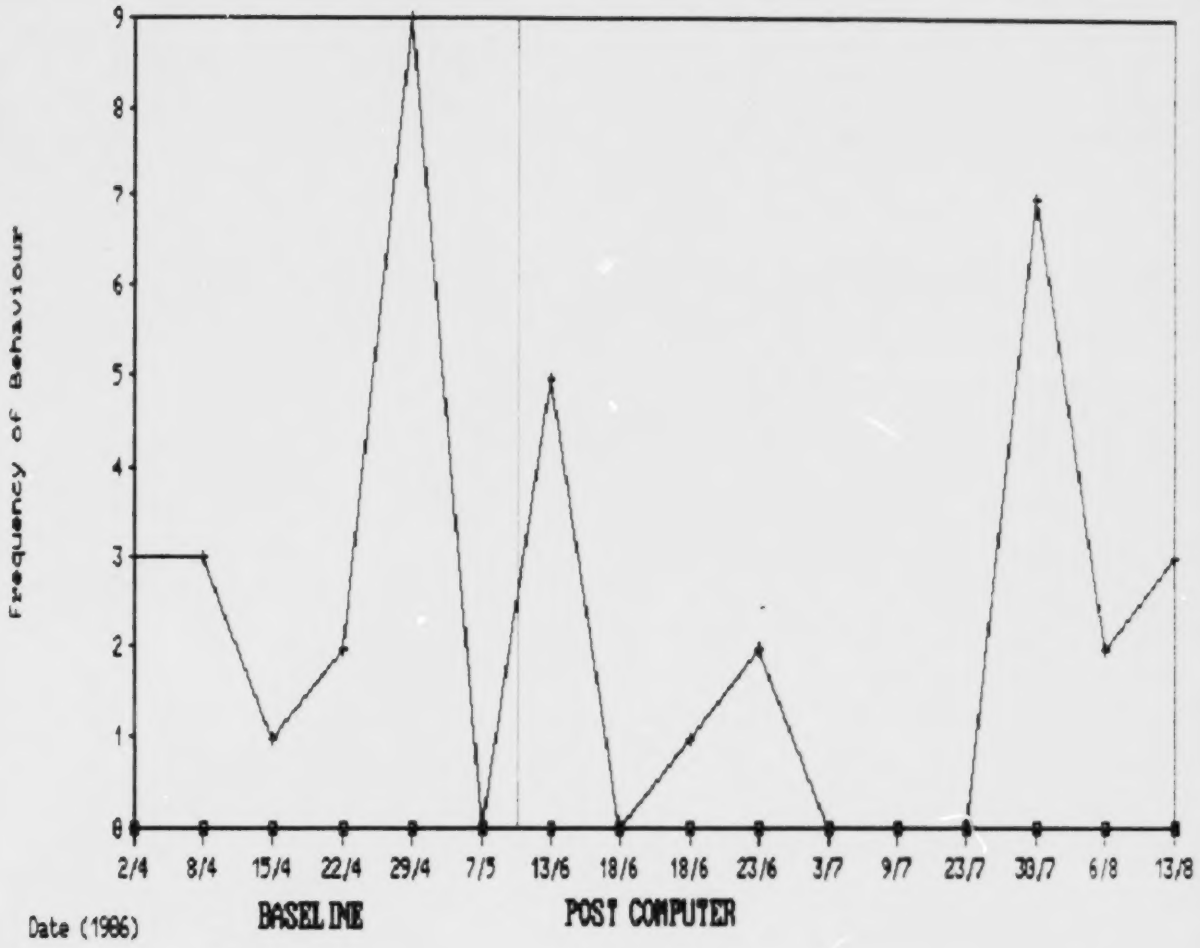
Rochelle is a 4-year-old girl who attends the other kindergarten. Her teacher described her as a 'quiet, mature girl, average build, very

affectionate'. Rochelle has one sister who is much older than she is, and her parents are 'older parents'. She is of 'average ability', a "regular attender", and is identified as European/Pakeha.

The teacher noted that Rochelle is 'not very interested in the computer' and that she 'enjoys playing in the family corner and produces good art work'.

When interviewed, Rochelle responded (both pre- and post-computer) that she thought computers were 'Quite a lot of fun'. More specifically, she mentioned one program she enjoyed ('playing the Bumble bee game') and she liked drawing activities ('drawing with the handle'). Rochelle said she had no dislikes about the computer, and that she did not have a computer at home.

Rochelle's behaviour was recorded 9 times during a total period of over 4 months. After the introduction of the computer, both of the behaviours Verbalization to Child about the Task and Co-operation/Helping/Sharing increased (see Figure 2). Although Rochelle rarely talked to the teacher about the task, this behaviour also occurred more frequently post-computer. Before the computer was installed, no incidences of Asking Adults for Help were recorded, but post-computer Rochelle occasionally asked an adult for help.

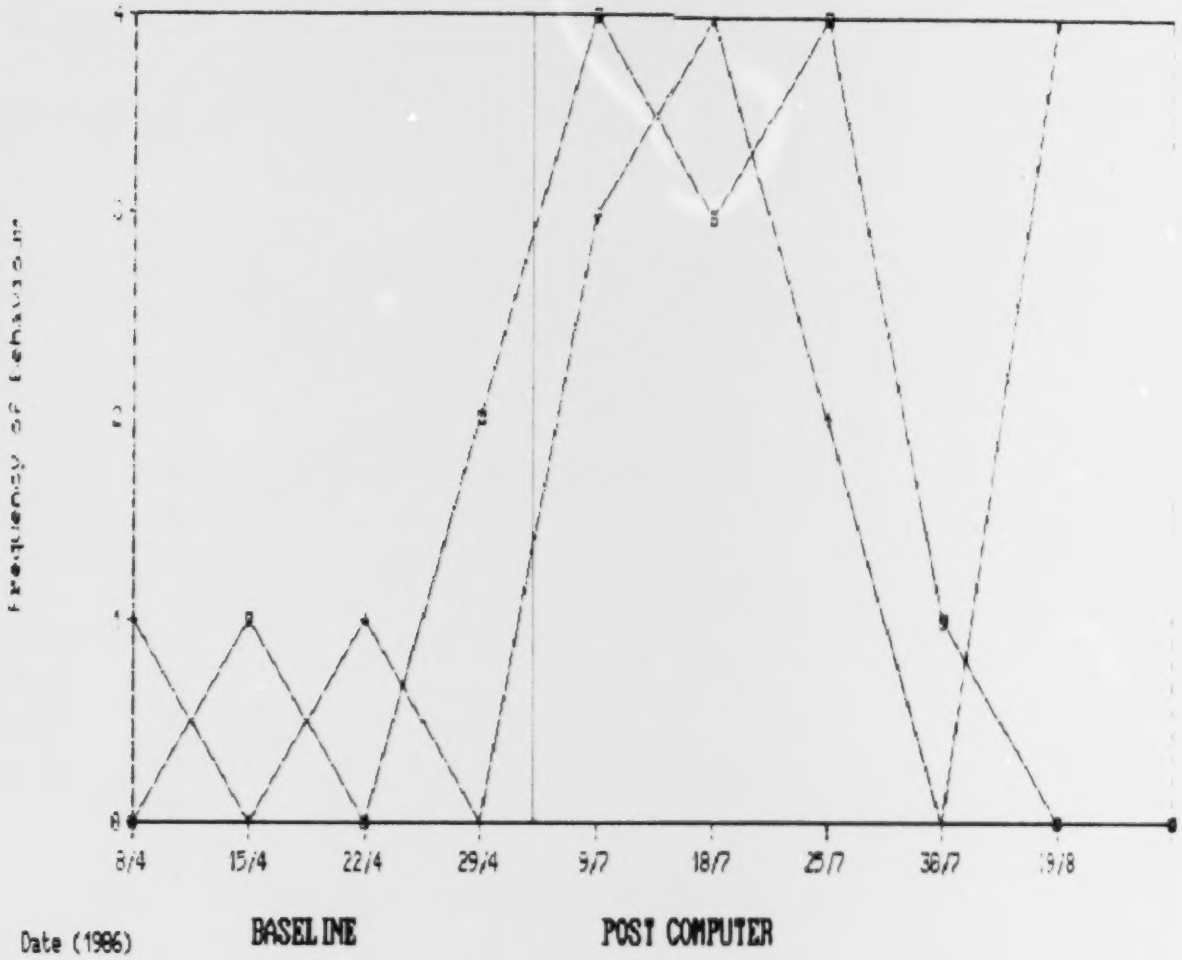


□ Co-operation/Helping/Sharing

\+ Verbalization to child-task

Figure 1

"Michael" Frequency of "Verbalization to Child-Task and Co-operation / Helping / Sharing" Pre- (Baseline) and Post-Computer



□ Co-operation/Helping/Sharing

\+ Verbalization to child-task

Figure 2

"Rochelle" Frequency of "Verbalization to Child-Task and Co-operation / Helping / Sharing" Pre- (Baseline) and Post-Computer

The increase post-computer in Rochelle's prosocial behaviour (notably Co-operation/Helping/Sharing) and her talking to other children about the task (see Figure 2), is consistent with the results of the group analyses. Although Rochelle seldom asked adults for help, her slight increase in this behaviour post-computer is also similar to the overall group trend.

There seems to be some discrepancy in this case between the teacher's and the child's perceptions. This might reflect the teacher's view that the computing activities sometimes impeded the children's creativity. The teacher reported that Rochelle's art work was good but she was not interested in the computer, whereas Rochelle herself said she liked drawing at the computer. Both in her diary records and when asked about suitable software during the interview, this teacher expressed concern that the children's drawings were becoming 'stilted' after they used software like 'Print Shop'. Perhaps this concern might explain the different views expressed by the teacher and the child. Alternatively, the child's positive responses about computers could reflect the effect of social desirability.

Joseph, one of the selected children from a junior school class, is identified as Maori. The teacher wrote that he is 'a cheeky, likeable boy who is "switched on" to what goes on'. He is also described as 'an only child who gets his own way'. He was making progress with reading, but left the school towards the end of 1986.

Joseph's mother came to help in the classroom once during the post-computer stage of the study, and 'enjoyed doing "Print Shop".' The teacher thought Joseph was 'very keen on the computer' and she commented that he 'quickly knew how to work the computer and would lead the others'. At the first interview, Joseph responded that computers were 'Quite a lot of fun.'

Joseph's behaviour was recorded on 11 different days during a time span of just over 4 months. He showed a high overall incidence of Verbalizing to Child about the Task, and this behaviour increased markedly during the first 3 weeks of post-computer observations. Prior to the introduction of the microcomputer no Co-operation/Helping/Sharing was recorded, but this prosocial behaviour began to occur 3 weeks post-computer (see Figure 3). He very rarely asked the teacher for help, but post-computer he occasionally talked to the teacher about the task. Although no aggression was recorded during the baseline observations, Non-verbal/Object Aggression and Physical/Verbal Aggression were observed occasionally in the post-computer phase. When recording these behaviours, the observer commented on the observation sheet, 'not sharing'.

Jospeh's tendency to talk to peers about the task and to co-operate,

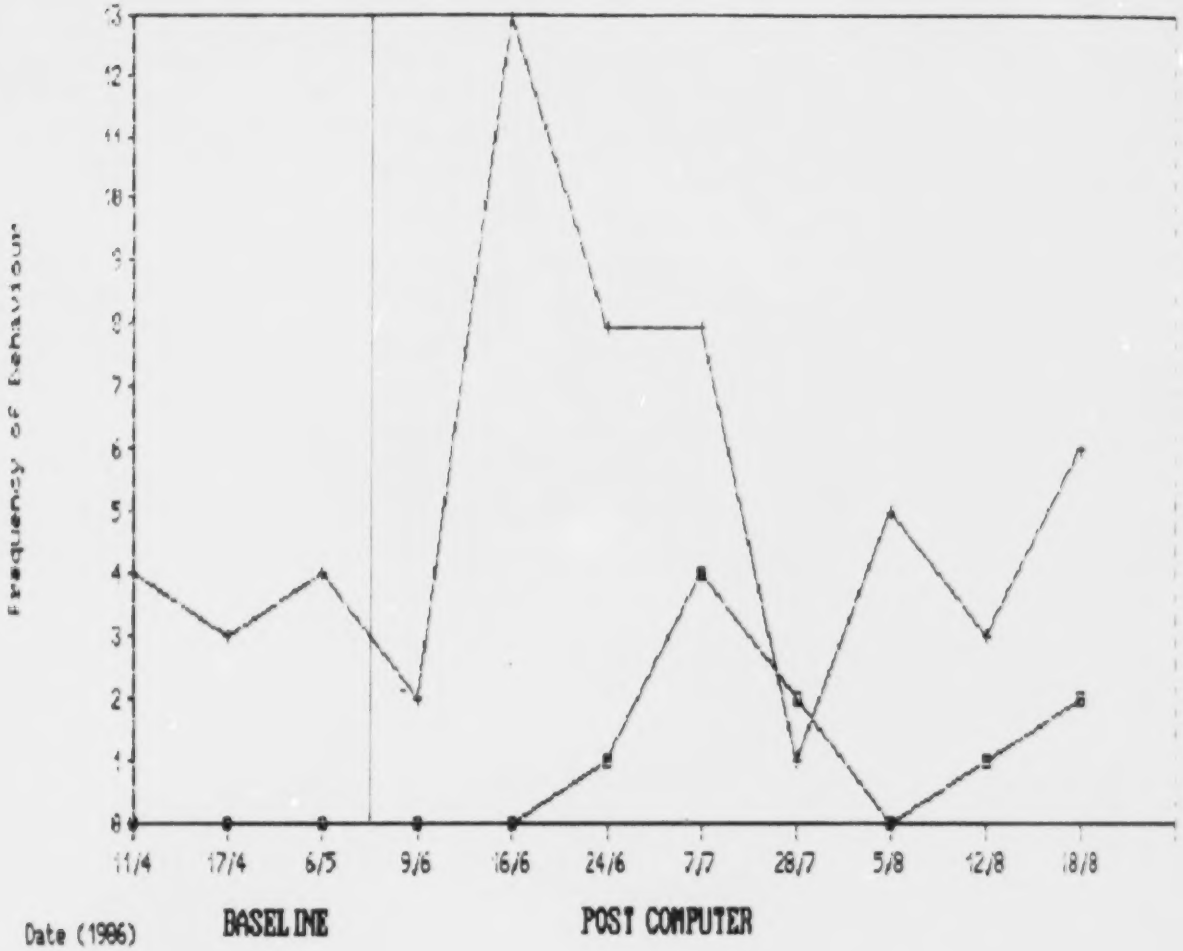
help, and share more post-computer was consistent with the trends of the group analyses. Unlike most of the children, he used more aggression post-computer. His rather inconsistent sharing is in keeping with the teacher's view that he was 'very keen on the computer', and that he was used to 'getting his own way'. His frequent talking to children about the task (up to 13 incidences during 5 minutes of observation post-computer), seems consistent with the teacher's perception of him as a leader at the computer.

Miriam is a pupil in the other junior school class. Her teacher described her as 'a delightful girl. She is sensible and reliable although she is a little shy'. Miriam is the eldest of three girls. She has one Maori and one Pakeha parent, and she is involved regularly in Maori 'customs'. Miriam is considered 'a very slow worker but capable of a high standard of work'. The teacher also described her as creative, very well behaved, a very competent reader, and healthy with a record of regular attendance.

According to her teacher, she is not very interested in the computer: 'Her interest in the computer was never great to begin with, but now (December 1986) she almost never uses it'.

During both interviews (pre- and post-computer), Miriam replied that computers were 'Quite a lot of fun'. At the final interview she specified two programs that she liked, the 'Muppet' program and making cards with 'Print Shop'. When asked whether there was anything that she didn't like about computers, her response was 'no'. She did not have a computer at home.

Miriam's behaviour was recorded 11 times during a 4 1/2 month period. Prior to the introduction of the computer, no Co-operation/Helping/Sharing was observed, but from 4 weeks post-computer onwards, this behaviour did occur. Both pre- and post-computer, Miriam talked to other children about the task, and this behaviour also increased post-computer (see Figure 4). During the entire observational phase, no talking to adults was recorded; Miriam's behavioural profile showed zero incidence of Verbalization to Adult Task,

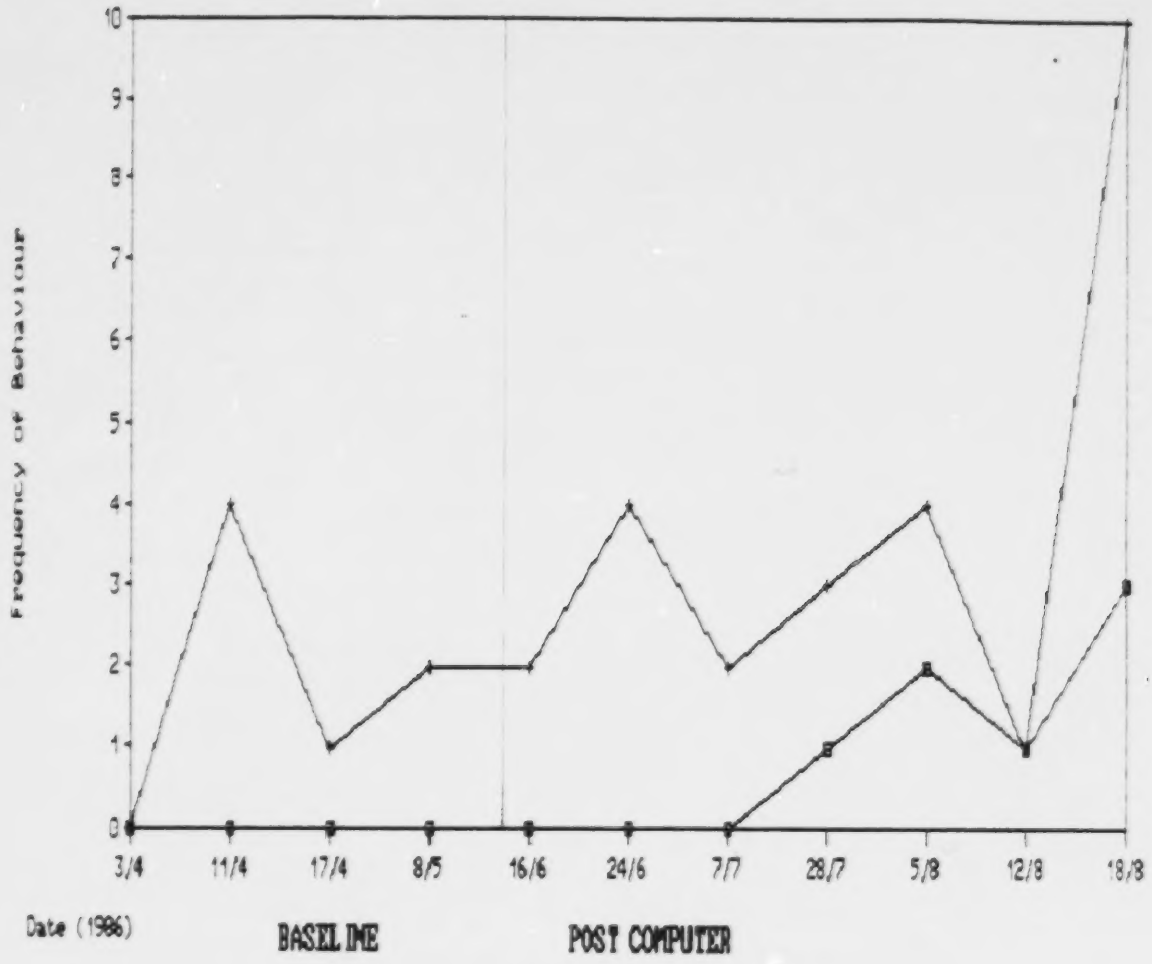


□ Co-operation/Helping/Sharing

\+ Verbalization to child-task

Figure 3

"Joseph" Frequency of "Verbalization to Child-Task and Co-operation / Helping / Sharing" Pre- (Baseline) and Post-Computer



□ - Co-operation/Helping/Sharing

\+ - Verbalization to child-task

Figure 4

"Miriam" Frequency of "Verbalization to Child-Task and Co-operation / Helping / Sharing" Pre- (Baseline) and Post-Computer

Verbalization to Adult-Non task, and Asking Adult for Help. In addition, no aggression occurred throughout the observations.

In some ways, Miriam's behaviour patterns are consistent with the overall group trends, particularly her more frequent talking to and co-operating with peers post-computer. However, only Miriam and one other child among the total 28 target children showed zero incidence of talking to adults.

There is some difference between the teacher's view that Miriam was not interested in the computer, and this child's own response that computers are 'quite a lot of fun'. Miriam may have been making a socially desirable response here. Alternatively, even if she was very interested in the computer, she appeared to talk to the teacher so rarely that her interest could be covert. Certainly though, the teacher's perception of this child as 'a little shy' is consistent with the observer's record of zero incidence of talking to adults.

In summary, four case studies have been presented, and some distinctly individual behaviours have emerged. Examples include Michael's lack of Co-operation/Helping/Sharing both pre- and post-computer, and Miriam's tendency not to speak to adults. Joseph's behaviour profile too, illustrates an unusual case of occasional aggressiveness post-computer. However, a number of consistencies with the group trends in behaviour have also been identified. Perhaps most notably, three of the four children talked to peers about the task more frequently post-computer (Figures 2,3, and 4).

The Teachers' Perceptions

Information about the teachers' perceptions, obtained from the interview transcripts and diary records, was organized into these themes: perceptions about the children's social interactions and related gender differences, perceptions of the children's problem solving, views on management issues (classroom organization, advantages and disadvantages of computers in the classroom or kindergarten), software-related issues, and perceptions regarding parental interest.

Perceptions of the Children's Social Interactions

When the four teachers were asked about changes in the children's social interactions, they all commented on differences in the grouping of the

children.

> Interviewer: 'Do you think the children's social interactions changed when the microcomputer was introduced?'
> Kindergarten Teacher: 'There were different groups of children working at the computer at the same time. Their grouping wasn't the same as it was perhaps at other activities. It was probably by chance rather than by choice I think...'

This teacher also mentioned that she did not see any adverse effects on social interaction:

> '...one of the surprises (was) that we had thought there would be a lot of aggression with wanting turns. But that very rarely eventuated and they tended to help each other.'

One teacher who organized her class into pairs at the computer also described differences in who worked with whom:

> School Teacher: 'The children didn't care who went with them as long as they were allowed to have a turn ... but it didn't worry them who was the other partner, boy or girl it didn't matter...And they had to have a turn each and they would sit there and talk to each other.'

She too mentioned that the children were not verbally aggressive after the introduction of the microcomputer.

> 'There wasn't much bossing because they had to have a turn...I mean there's no point in telling their partner off because they wouldn't have a turn until the other partner had their turn.'

When asked more specifically about co-operation at the computer, the teachers all made positive comments. In response to the interviewer's question 'How much do the children co-operate together when using the computer?' the teachers' replies included:

> Kindergarten Teacher: 'There's normally two or three children working together...they do co-operate surprisingly well and a lot of talk very often goes on at the computer about what they're doing.'
>
> Another Kindergarten Teacher: 'In fact they co-operated brilliantly. You know, that was one of the areas that we expected problems, that there would be people wanting to have their turns "right now". But they were really good about taking turns and co-operating and being helpful. It hasn't changed. It's been the same from the start...'.
>
> School Teacher: 'Quite a lot'
> Interviewer: 'Quite a lot?'
> School Teacher: 'There's quite a lot (of co-operation) going on, like one (child) on the keys and one pointing to the screen.'

One teacher did express concern that the children might collaborate too much, and not do their own work.

> School Teacher: 'Sometimes, it's a little unavoidable really but sometimes they volunteer information and they really shouldn't. But they do know that in anything, you've got to try and do your own work first.'

However this teacher, too, made positive statements about the children's co-operative turn taking:

> 'They tend to be very conscious of turns. Quite often they'll sit down and say 'now you have one turn and I'll have one turn'...They're very good actually at figuring out how long they're supposed to be on the computer.'

Overall then, the teachers made quite positive statements about the impact of the microcomputer on the children's social behaviour. Their diary entries also indicated that they experienced very few problems related to the children's social interactions.

Views on Gender Differences among the Children

When asked about gender differences in the children's social interactions, three of the four mentioned that the boys were more eager to use the computer.

> Interviewer: 'Have you noticed any differences between boys and girls in their social interaction?'
> Kindergarten Teacher: 'Not in their social interactions really, but there definitely have been more boys using the computer than girls, and that's the difference...It was more evenly spread in the beginning, whereas now the more consistent users tend to be the boys.'

The teacher did go on to mention some perceived behavioural differences at the computer:

> 'the boys often, if they're bored, will get sort of silly at the computer. And they'll go off in their own direction with each other, or someone will come along and press one of the buttons so the whole program goes back to the start again. The girls once again, are sort of very precise about things and do things the correct way...'

One of the junior school teachers suggested some reasons why the boys seemed more eager. She mentioned that the differences had not been there at first but by the second term the computer had been in the classroom some girls were less eager to use it. Girls tended to 'shy away from (the) couple of whizz

kids'. These 'whizz kids' were boys, and they were described as 'dominant types'.

In contrast however, the other junior school teacher thought there had been no gender differences in computer use or interactions. The children in this class used the computer in pairs, and the teacher also thought their behaviour was unaffected by the gender of their partners.

> '...It didn't really worry them at all, what the partner was. The reaction would be the same.'

The teachers did report individual differences in the children's use of the microcomputer. When the computers were first introduced to the classrooms and kindergartens the teachers' diary entries indicated that almost all of the children were enthusiastic. At this stage, one kindergarten teacher wrote about the children's enthusiasm: 'keen to have a go!', and the school teachers wrote 'Great! They couldn't wait to take the sign they've made home,' and 'All of them are (enthusiastic) in school time and about six come before school time and use it.' However, one kindergarten teacher did note that 'The shyer children' were not expressing much interest in the computer.

Subsequent daily diary entries from all four teachers suggested that many of the children continued to use the computer enthusiastically over the next few months. 'Leaders' and 'experts' were emerging in both the classrooms and the kindergartens. All four teachers named at least one girl and several boys among the 'experts', and this trend continued to be evident in their diary entries. After the computer had been in her classroom for one term, one teacher noted in her diary, 'I would consider virtually the whole class to be experts now.'

Perceptions of the Children's Problem Solving

The teachers also commented on the children's problem solving strategies at the computer, noting any changes that occurred over time. Descriptions of children's approaches to problem solving were obtained from the interview transcripts and from daily entries in the teachers' diaries.

When asked by the interviewer 'How do the children tend to solve problems when they are at the computer?', the kindergarten teachers, in particular, replied that many children sought help from adults:

> 'First of all they'll call for help...'

The school teachers mentioned that the children frequently helped each other.

> 'It's not very often that it's me (the children will ask for help). The children start to get to know who's really good at what's going on ...'

In the kindergartens, too, the children gradually tended to help one another.

> Kindergarten teacher: 'On some occasions I used to withdraw the adult from the computer so the children could work it out ... for themselves without being dependent on the adult all the time.'

Other problem solving strategies mentioned by the teachers included the children's experimenting with the keyboard, and their finding solutions by listening and learning.

> Kindergarten teacher: '...they're very observant. They're obviously watching and taking it all in and able to pick it up. We've got one in particular who was...watching and listening then telling people how to solve problems. A lot of them will just press the keys randomly. Nine times out of ten it's the wrong one, and they seem to give up quite easily if they don't get the result they want. Other children will just press things randomly and are quite happy with that, with nothing resulting.'

Some children in the junior school classes started experimenting randomly with the keyboard, and then became more selective.

> Junior Class Teacher: 'They learned after a while that you either push the return button or space bar or use a joystick and something would happen.'

Changes in the children's problem solving were described further when the interviewer asked, 'As they have become more used to using the computer, how have their problem solving strategies changed?' In general the responses to this question showed that the children tended to consult one another more and to experiment more.

> Kindergarten teacher: 'Probably the higher achievers, they've persevered more ... I think (the other children) probably would be prepared to try more like pressing more keys or something before they would ask for a teacher. They would ask each other more before they come and ask the teacher.'

One school teacher replied, 'I don't think they've really changed.' Right from the beginning, this teacher found the children were asking one another 'because I think it's quicker than waiting for me and I also think they can understand each other's problems more easily.' However she did add,

> 'I think once they become more confident and competent they know they can try things... they might (press a key) then try the space bar and

they might try the joystick. So they're tending to try things more and asking if they can try.'

These children too, seemed to be willing to experiment more, and the teacher noted that they seemed to be transferring experiences with one program to other situations when new software was introduced.

Comments in the teachers' diaries were consistent with and elaborated on their responses to the interview questions. Every two or three days the teachers recorded information about the children's need for assistance, the difficulties they encountered and their coping strategies, and their perseverance and concentration.

When the microcomputers were first introduced, most of the children were eager to persevere at the keyboard, although they were encouraged to take turns. Few problems were encountered by the children, and one kindergarten teacher reported 'No real difficulties. Children quite confident, not frightened by the machine or (by) making mistakes.'

Some difficulties that did arise for the kindergarten children during the first weeks included adjusting to using upper case letters, controlling the space bar, and learning that the program would not load when the 'shift lock' key was down.

> 'Children need assistance to find their way around the keyboard. Children are adapting to identifying capital letters when having been taught to write lower case'.
> (Kindergarten Teacher's diary, Week 2 after computer introduced).

Collaborating together helped with this problem.

> 'Children are helping other children to find their way around the keyboard. Some children have picked up the steps quickly.'

In the junior school classes too, the children needed to learn just to tap the space bar rather than holding on to it. The teachers were enthusiastic about the children's perseverance.

> 'Wonderful (the computer) will keep them occupied. They have a flushed/concentrated look about them.'

Many of these children too, were solving problems by collaborating and experimenting. They would

> 'try out their own techniques' (teacher, day 2). 'They talk to each other and solve their own problems. If the children come to me and say "It's stuck" I tell them to push the space bar or Return.' (teacher,

week 2).

As the weeks progressed, the teachers noted the specific problems encountered with different software packages, and they continued to record the children's coping strategies. For some kindergarten children, adjusting to upper case letters was an ongoing difficulty. When the program 'Print Shop' was in use, their teacher wrote in her diary,

> 'All those using Print Shop had some difficulty recognizing capital letters, reinforcing my realization that we need to take care that letters we print resemble those on computer as closely as possible. All were prepared to look carefully to try to find letters but if unable to locate it asked parent supervising the computer to help'.

She also noted that four children persevered for 20 to 30 minutes each making a banner or poster. They were enthusiastic about having produced a picture to take home.

The junior school teacher continued to report that the children persevered and concentrated well and that some children consulted their peers to solve problems. For example, two months after the computer was introduced, one teacher wrote this about the children's coping strategies:

> 'They are very aware of who was on the computer before them - so they go and ask that person if necessary.'

She described the children's perseverance and concentration as 'Too good!' The other junior school teacher recorded that 'the children are now confident enough to fix up their own errors', they needed no assistance from adults, and 'when they are thinking they forget what is happening in the room'.

Occasionally, limitations of the hardware on software had some impact on the children's motivation and perseverance. When the joystick required repairs for example, one kindergarten teacher wrote 'low interest in the computer on these two days as joystick had broken and we were limited to two programs 'Facemaker' and 'Sticky Bears'...' The children showed 'limited concentration with these very familiar programs; it was as if (they) had exhausted all possibilities.' However, when the equipment was functioning adequately and there was sufficient software available, the teachers generally considered that the children concentrated very well, and that this overall trend was still continuing two or three months after the computer was introduced.

Views on Management Issues

Pre-Computer Phase: Inservice Training and Workload

Before the microcomputers were introduced to the classrooms and kindergartens, the teachers participated in a computing course, and were involved in selecting age-appropriate software. Diary entries during this phase of the study suggested that the computers were affecting the teachers' workloads. A junior class teacher commented in the first week of the study that she had helped conduct an evening meeting 'to familiarize parents (7:30 p.m. to 10 p.m.)', and she spent '15 to 20 minutes after school looking at software available'. One of the kindergarten teachers wrote 'the computer studies have definitely added an extra workload. Hard to find time to experiment with computer.' Another reported that she spent 2 hours per week at the training course at teachers college 'plus at least 2 hours a night practicing on the computer' and also two hours looking at software. Although time-consuming, the course undertaken at the teachers college was generally helpful, and the kindergarten teacher later wrote 'Now feel more confident using computer, after 5 weeks of course at Training College on "Communicating with Computers" - Computers in Early Childhood Education.'

The research itself certainly added to the teachers' workloads. All four teachers commented that completing interview booklets (the pre-computer interviews of the children) was time consuming. Their regular diary entries, which were quite comprehensive, also added to the workload. All of the teachers found that the presence of the observer was generally unobtrusive, and the children were not aware of who was being observed.

Post-Computer Phase: Classroom Organization and Workload

Safe storage of the computers was an initial problem for the kindergarten teachers. A kindergarten teacher reported in her diary early in Term 2 that one influence on her workload was 'The worry of security - organizing this. No support from the Board or Association on this matter.' Eventually, parent volunteers installed locks on the storeroom and bars on the windows.

In the kindergartens, the computers were placed centrally so that someone was 'nearby or beside it when needed.' The teachers continued to report that this arrangement worked well. In the school, carrying the computer was seen as a difficulty until trolleys were obtained. A few weeks after the computer was introduced, when trolleys were in operation, a class

days in our room which gives me time to look for another one.' The school teachers reported intermittent difficulties with the joysticks, which required repairing on several occasions. Moving the printer between classrooms took time too, and setting up the printer was mentioned as one effect on the school teachers' workloads.

All of the teachers found that the busy times of the day were when the computers were set up and when they were put away. One kindergarten teacher also reported that emergencies were difficult, for example when a child was hurt. All teachers reported that introducing new programs took time. A kindergarten teacher wrote 'Most children need starting information. One or two are able to start (computer) programs by themselves'.

After the computers had been in the classrooms and kindergartens for one complete school term, the teachers experienced fewer time pressures. One of the school teachers reported that there was 'virtually no extra workload at all apart from fetching it (the computer)'. However, this teacher did find reading a busy time. She felt she needed to be monitoring children's turns at the computer while she was simultaneously engaged in reading activities with other children. Another teacher found Monday morning a busy time 'after the parents take them home' because 'the programs get swapped over on the two trolleys.' She coped by 'knowing the programs' thoroughly. A kindergarten teacher wrote at the end of the second term,

> 'We had lots of worries and concerns at the beginning. These have not come to be. The study in my view has proved that it is the adults who are afraid of the new technology and the children just accept it as part and parcel of the programme. Everything has gone very smoothly.'

When interviewed at the end of the third term, after two terms of computing in the classroom or kindergarten, the teachers commented on specific organizational problems and made some recommendations about management strategies. In response to the question 'What have been the major problems associated with having a microcomputer in the classroom?' the teachers mentioned time; transport, storage and security of the computer; and arranging rosters and turns for the children. One kindergarten teacher and one junior school teacher talked about the inconvenience of moving the computer about. Another kindergarten teacher commented that

> 'The biggest factor would be the time. I feel, the other teacher feels too, with just the two of us, we haven't got the time to put into the computer that we'd like to, ... to extend the children'.

The teachers talked about how they had dealt with these problems. To

obtain more suggestions about management strategies, they were asked:

> 'Let's imagine that microcomputers are about to be introduced to a nearby school (kindergarten). What would you recommend the teachers do to avoid management and organizational problems?'

One teacher, who had described organizing turn taking as a difficulty, recommended initially using a colour card system, where each child is given a set of coloured cards and uses these cards to obtain access to the computer. Certain days are set aside for certain colours (e.g. 'Monday's red and Thursday's red, Tuesday's blue and Friday's blue, and Wednesday anybody's day'). No more cards are issued until every child has used up the four cards allocated.

Another teacher, concerned with storage and transport, commented that 'no matter how organized you are, you've got to put (the computer) away for security reasons', so teachers need to arrive early in the morning to set them up. She also recommended taking time to become familiar with the program in advance,

> 'I think you've got to take half the weekend. You can't do it in school time because you've got so many distractions. And one weekend saves a whole term's work really. If you go through all the games at home.'

One of the kindergarten teachers, also concerned about the logistics of moving the computers around, recommended that 'first of all they get proper facilities for them', including large trolleys to move them around. She suggested that the teacher should attend a course before putting the computer in the kindergarten. The other kindergarten teacher thought obtaining help was the main requirement, and she too recommended attending a course. In addition, she suggested that having a 'travelling expert' who 'spent time in each place and could give the children an added insight ... would be really good.'

Advantages and Disadvantages of Computers

During the interview at the end of 1986, the teachers were also asked about the advantages and disadvantages of having a microcomputer in the classroom or kindergarten. There seemed to be some differences between the school and the kindergarten teachers' responses to these questions. When asked about advantages for themselves, the kindergarten teachers thought it could be used for administration, whereas the junior school teachers described the computer

as 'another very good teaching activity.' Both the kindergarten and the school teachers mentioned time as one disadvantage for themselves, and one junior school teacher found sharing the computer with other classes and having to introduce it to other classes the main disadvantage.

The advantages for children were described as 'interest' in the case of the kindergarten children, and 'learning' for the school children. The kindergarten teachers seemed less certain than the school teachers that the computer had advantages for the children. One kindergarten teacher commented:

> 'I think the biggest (advantage) would be the interest I suppose, the children's interest in the computer.' But, 'there's nothing that stands out, particularly with the quality of the software.'

The school teachers however, seemed more positive about learning benefits:

> 'A very good learning activity'. 'It keeps them absolutely involved... They don't tire, so their concentration is there.' (Junior School teacher).

When asked about the disadvantages for the children, one kindergarten teacher answered,

> No disadvantages but '... there's nothing that stands out about it, if you had to balance out the expense of the computer against what it was going to provide then I'm afraid at this stage kindergarten teachers would probably opt for having new tables and other things that they could see they would get more use out of. Particularly with the quality of the software.'

The other kindergarten teacher also replied 'the lack of suitable software.'

The school teachers perceived the main disadvantage for the children as being insufficient access to the computer. One commented that there was not sufficient time for them to have a turn every day, and the other mentioned the slow turnover of software once they were sharing with other classes in the school.

As the kindergarten teachers thought the range and quality of the available software was a major disadvantage, evaluation of the software became a further focus of the study. Throughout 1987, the teachers met together to review the software packages used in the kindergartens and in the school.

Perceptions regarding Parental Interest

The junior school teachers reported that parental interest in the computers tended to be low. During the first term the computer was in the classroom

(Term 2, 1986), they made daily notes in their diaries about the number of parents who came to the classroom and what they did there. With very few exceptions, the teachers continued writing 'none' or 'not yet' in that section of the diary. However, one kindergarten teacher frequently recorded that from 3 to 6 parents would group around the computer at the start of the session. These parents usually spoke to the parent who was helping and assisted the children to get started. At the other kindergarten too, 2 or 3 parents, sometimes fathers, tended to gather at the computer toward the end of the session. The kindergarten teacher wrote on one occasion

> 'One (parent came) to supervise - (I) had to diplomatically withdraw her as she was giving too much help and not letting (the) children work things out for themselves.'

By the end of the second term of computing, the junior school teachers were still concerned at the relative lack of parental interest and enthusiasm. In response to the interview question 'Do you think that parents in general are showing much interest in the computing activities?' the teachers commented 'No, well not that I know of personally' and 'No, not as much as I thought they would...'. Both expressed disappointment in the low levels of parental involvement. None of the parents had expressed concern about the computer, but the school teachers also felt that parental enthusiasm was surprisingly low.

The kindergarten teachers commented that the parents were interested at first, but after 2 terms their visits and questions were much less frequent. Only one parent at one kindergarten had ever stated any concerns. Although this mother expressed initial doubts about the computer on religious grounds (she felt it was better for her daughter to use her own talents), she did not want the child to be stopped from using the computer.

One kindergarten teacher felt that relatively few parents had come to help because they regarded the teachers as the professionals. The other said she had reduced the amount of parent helping because the parents 'were wanting to do the work themselves rather than let the children experiment.'

The teachers at the school expressed some concern about the apparently low levels of parental interest. Consequently the parents' views on computers were also investigated.

The Parents' Perceptions

The exploratory findings on the parents' perceptions were reported back to the teachers in April 1987. Parents' responses to the brief set of questions were coded and presented as percentages.

Parents' Views on having a Computer in the Classroom or Kindergarten

Parents' responses to the question, 'What do you think of having a computer in your child's classroom/kindergarten?' were coded on a 1 to 5 scale (1 = strongly positive/favourable; 2 = positive/favourable; 3 = neutral; 4 = neutral or positive with some specified reservations; 5 = negative/unfavourable). Examples of responses codes as 1 (strongly positive) were:

> Mother (1) 'I feel the computer provides another interesting, stimulating, creative way for the children to learn and develop their creativity, concentration'. (Kindergarten sample).
>
> Mother (1) 'It would be a great advantage to everyone as they are such a major part of everyday life if not now in the future.'
> Father (1) 'Essential'. (School sample).

Responses codes as 2 (positive) included:

> Father (2) 'Good idea'. (Kindergarten sample).
>
> Father (2) 'Good idea for children to lose any fear of this tool.' (School sample).
>
> Mother (2) 'A good cause'.
>
> Father (2) 'Good'. (School sample).

Parents who responded in a neutral manner, coded as 3, made statements like:

> Father (3) 'Alright'. (Kindergarten sample).

Responses defined as 4 (neutral or positive with some specified reservations) included:

> Mother (4) 'OK if interest is really there??' (sic) (Kindergarten sample).
>
> Mother (4) 'Fine as long as the children are not pressured to use it, if it is just one of the other experiences that are available to them such as painting and blocks'. (Kindergarten sample).
> Father (4) 'It's in keeping with modern technology but I don't like pupils becoming reliant on the computer and not being able to do basic

maths etc. manually'. (School sample).

Very few of the responses were coded as 5 (negative/unfavourable). These included:

Mother (5) 'Not as a continuous thing'.

Father (5) 'Not important at this age'. (Kindergarten sample).

Mother (5) 'I don't like them'. (School sample).

Details of the numbers and percentages of parents' responses across categories are given in Tables 7-9. In the kindergarten sample 36% were strongly positive (category 1) and 46% were positive or in favour (category 2) (see Table 6), while in the junior school sample 45% of the responses were coded as strongly positive and 33% as favourable or positive (Table 7). In total, five or 3% of the parents gave unfavourable responses (coded as 5); 4% of the kindergarten parents' responses and 1% of the junior school parents' responses were coded as 5. Overall then, a very small number of parents were definitely not in favour, but the majority of parents seemed to respond favourably to having a computer in the classroom or kindergarten (see Table 9).

Table 7

Parents' Views on Having a Computer in the Kindergarten

	Mothers[a] N	Fathers[b] N	Total[c] N	%
1. Strongly in favour	22	10	32	36
2. In favour, positive	18	23	41	46
3. Neutral	1	1	2	2
4. Neutral or positive with specified reservations	6	3	9	10
5. Opposed, negative	2	2	4	5
6. "Don't know"	1	-	1	1

Note: Dash indicates zero frequency

a Kindergarten mothers, N = 50
b Kindergarten fathers, N = 39
c Total kindergarten sample, N = 89

Table 8

Parents' Views on Having a Computer in the Classroom

	Mothers[a] N	Fathers[b] N	Total[c] N	%
1. Strongly in favour	23	17	40	45
2. In favour, positive	19	11	30	33
3. Neutral	2	4	6	7
4. Neutral or positive with specified reservations	5	6	11	12
5. Opposed, negative	1	-	1	1
6. "Don't know", no response	1	1	2	2

Note: Dashes indicate zero frequency

a Includes 1 grandmother, N = 51
b Includes 1 grandfather and 2 'other adults', N = 39
c Total parents from the junior school sample, N = 90

Table 9

Parents' Views on Having a Computer in the Classrooms and Kindergartens

	Mothers[a] N	Fathers[b] N	Total[c] N	%
1. Strongly in favour	45	27	72	40.2
2. In favour, positive	37	34	71	39.7
3. Neutral	3	5	8	4.5
4. Neutral or positive with specified reservations	11	9	20	11.2
5. Opposed, negative	3	2	5	2.8
6. "Don't know", no response	2	1	3	1.7

a Includes 1 grandmother, N = 101
b Includes 1 grandfather and 2 'other adults' N = 78
c N = 179 (kindergarten children's parents, N = 89, junior school parents N = 90)

Parents' Familiarity with Computers

To explore the parents' familiarity with computers, questions were asked about whether parents had a computer in the work place, and whether they would feel comfortable using a computer. The percentages of kindergarten and junior school parents with a computer in the work situation are shown in Tables 10 and 11 respectively, and the combined percentages for the total sample are given in Table 12. Relatively few mothers (12%) but rather more fathers (63%) had a computer in the work situation (see Table 12).

Percentages of parents who would feel comfortable using computers are shown in Tables 13 to 15. Overall, 73 (72%) of the mothers and 66 (85%) of the fathers responded that they would feel comfortable using a computer (Table 15). Some examples of positive responses were:

Father (Yes) '(Good) to use up-to-date technology'.

Father (Yes) 'Part of the job'.

Mother (Yes) 'They're a sign of the times'.

Grandfather (Yes) Used to have one at work (am retired) 'Most situations can be applied'.

Mother (Yes) 'It would be a challenge I would enjoy'.

Parents who responded that they would not feel comfortable using a computer gave replies like:

Mother (No) 'I would not know how to use it'.

Mother (No) 'Lack of experience'.

Father (No) 'They are operated by permanent staff'. (At work)

Mother (No) 'Computers make mistakes too'.

The kindergarten mothers were more likely than the mothers from the school sample to respond that they would feel comfortable using a computer (see Tables 13 and 14). Experiences of parent helping at the microcomputer sites may have improved the confidence of the kindergarten mothers, which would explain why 88% of them felt comfortable about using computers. Conversely, in the junior school, where only 57% of the mothers reported that they would feel comfortable using a computer, very few parents had offered to help.

Table 10

Percentages of Kindergarten Parents with a Computer in the Work Situation

	Mothers[a]		Fathers[b]		Total[c]	
	N	%	N	%	N	%
Yes	3	6	23	59	26	29
No	47	94	16	41	63	71

a Kindergarten Mothers, N = 50.
b Kindergarten Fathers, N = 39.
c Total kindergarten parents, N = 89.

Table 11

Percentages of Parents from the School Sample with a Computer in the Work Situation

	Mothers[a]		Fathers[b]		Total[c]	
	N	%	N	%	N	%
Yes	9	18	26	57	35	39
No	42	82	13	33	55	61

a Includes 1 grandmother, N = 51
b Includes 1 grandfather and 2 'other adults', N = 39
c Total parents from the junior school sample N = 90

Table 12

Percentages of Mothers and Fathers with a Computer in the Work Situation

	Mothers[a]		Fathers[b]		Total[c]	
	N	%	N	%	N	%
Computer	12	12	49	63	71	39.7
No computer	89	88	29	37	108	60.3

a Includes 1 grandmother, N = 101
b Includes 1 grandfather and 2 'other adults', N = 78
c N = 179 (kindergarten children's parents N = 89, junior school parents N = 90)

Parents' Views on having a Computer in the Home

Finally parents were asked, if they were able to have one, how they would feel about having a computer in the home. The intention here was to probe further how they felt about computers, because in turn this could influence their interest in the microcomputers at the schools or kindergartens.

Here too, parents' responses were coded on a 1 to 5 scale (1 = strongly positive; 2 = positive; 3 = neutral; 4 = neutral or positive with some specified reservations; 5 = negative). Some examples of responses for each category were:

Father (1) 'It would be a tremendous learning experience for my children and also my wife and I.'

Mother (1) 'Love to have one' (School sample).

Father (2) 'Good'.

Mother (2) 'Good' (School sample).

Mother 2) (Has a home computer) 'Educational and recreational'.

Father (2) 'Good educational too'. (Kindergarten sample).

Mother (3) 'Okay'.

Father (3) 'Okay' (School sample).

Mother (4) 'Good idea - as long as there were suitable programs for it - and that it does not replace such things as time together as a family, i.e. playing games, reading stories, etc.' (Kindergarten sample).

Mother (4) 'Provided it is essential for the kid's education'. (School sample).

Mother (5) 'Not really in favour of having a computer in the home'.

Father (5) 'It would probably be used at the expense of more important outdoor physical activities'. (Kindergarten sample).

The percentages of parents responding on each category are shown in Table 16. In total, 42 (23.4%) of the parents expressed strongly positive views on having a computer in the home, and a further 74 (41.3%) had positive views. A number were neutral (N = 20, 11.2%) and neutral or positive with specified reservations (N = 25, 14%). Ten parents (5.6%) had negative views on having a computer in the home. When the percentages were calculated separately for the kindergarten and school samples, they were fairly similar for the two groups.

In summary, many of the parents appeared to favour having a computer in the school or kindergarten and in the home. However, some parents were neutral or expressed certain reservations. Only a small number of parents had negative responses to having a computer in the home, and even fewer expressed negative views on having a computer in the classroom or kindergarten.

Table 13

Percentages of Kindergarten Parents who would Feel Comfortable Using a Computer

	Mothers[a]		Fathers[b]		Total[c]	
	N	%	N	%	N	%
Yes	44	88	36	92	80	90
No	6	12	3	8	9	10

a Kindergarten mothers, N = 50
b Kindergarten fathers, N = 39
c Total Kindergarten parents, N = 89

Table 14

Percentages of Parents who would Feel Comfortable Using a Computer (Junior School Sample)

	Mothers[a]		Fathers[b]		Total[c]	
	N	%	N	%	N	%
Comfortable	29	57	30	77	59	66
Not Comfortable	18	37	9	23	27	30
Not sure, no response	4	8	-	-	4	4

Note: Dashes indicate zero frequency
a Includes 1 grandmother, N = 51
b Includes 1 grandfather and 2 'other adults', N = 39
c Total parents from the junior school sample, N = 90

Table 15

Percentages of Mothers and Fathers who would Feel Comfortable Using Computers

	Mothers[a]		Fathers[b]		Total[c]	
	N	%	N	%	N	%
Comfortable	73	72	66	85	138	77.7
Not Comfortable	24	24	12	15	36	20.1
Not sure, no response	4	4	-	-	4	2.2

Note: Dashes indicate zero frequency
a Includes 1 grandmother, N = 101
b Includes 1 grandfather and 2 'other adults', N = 78
c N = 179 (Kindergarten children's parents N = 89, junior school parents N = 90)

Table 16

Parents' Views on Having a Computer in the Home

	Mothers[a] N	Fathers[b] N	Total[c] N	%
1. Strongly positive	27	15	42	23.4
2. Positive	38	36	74	41.3
3. Neutral	12	8	20	11.2
4. Positive/Neutral with specified reservations	15	10	25	14.0
5. Negative	5	5	10	5.6
6. "Don't know" or no response	4	4	8	4.5

a Includes 1 grandmother, N = 101
b Includes 1 grandfather and 2 'other adults', N = 78
c N = 179 (kindergarten children's parents, N = 89, junior school parents N = 90

4: DISCUSSION

The majority of young children in this study perceived computers as fun both before and after using them. After they had hands-on experience in the school or kindergarten setting, only a very small minority of the children described computers as 'no fun at all'. These findings lend support to the view that, for many but not all young children, computers are intrinsically motivating in the sense of providing pleasurable or enjoyable learning activities.

As the children quite frequently named specific software as aspects they liked and disliked about computers, the 'holding power' that Papert (1980) attributed to computers appears to be mediated by the software used. In this study, children as young as 4 years old clearly could specify their preferences regarding software. Consistent with Smith and Keep's (1986) comment that children have clear views on software and that it is worthwhile consulting them on their opinions, a substantial number of children in this study made spontaneous responses about the software they liked and/or disliked.

Overall then, this research suggests that 4- to 7-year-old children in educational settings tended to be competent at forming and articulating specific likes and dislikes regarding computers. However, as some children responded ambiguously, careful and supportive questioning and probing are required when interviewing children in this age range.

For many children, computers were also motivating in terms of learner persistence and high task involvement. Motivational factors like task involvement and persistence seemed to underlie some children's stated dislikes about computers, including waiting for turns or having to terminate their turns. The teachers' diary entries also tended to emphasize the children's persistence and enthusiasm. However, like the children's responses, the teachers' comments showed that there were individual differences, and that some 'shyer children' needed support to persist with having their turns at the computer.

Among the subsample of observed children, task involvement was sometimes evident in the frequency of their task-related social interactions with peers, teachers, and other adults. The 28 observed children in this study certainly did not appear to become socially isolated when a microcomputer was introduced to kindergartens and junior class settings. The findings tend to support Hill's (1985) revised view that working with computers can have a positive

influence on young children's socialization.

The analyses on Verbalization to Child-Task show that the children used this behaviour more often after the microcomputers were installed. The tendency to talk to peers about the task more post-computer was consistent across settings (junior classes and kindergartens) and accordingly across age groups (4-year-olds and 6-year-olds). It seems logical that the 4-year-old children's changes in behaviour post-computer cannot be attributed simply to maturation then, because the change in behaviour was consistent across the two age cohorts.

This result is interesting in view of Carmichael's (1985) Canadian findings. Carmichael et al. reported that the teachers participating in their computer study unanimously agreed the computer 'can be a powerful facilitator of social interaction' especially when teachers encourage students 'to learn from each other and to share their findings'. (Carmichael et al, 1985, p. 70). When young children work at a computer with one or more peers, talk about the task at hand does seem to be facilitated.

Unlike Klinzing and Hall's (1985) results, the observational analyses do not show an increase in children's praising of their peers post-computer. Praise, co-operation, and aggression occurred relatively rarely in this study. Although the individual profiles illustrate that a few individual children did not use the behaviour Co-operation/Helping/Sharing at all, and there were wide standard deviations here suggesting marked individual differences, this prosocial behaviour quite often did increase post-computer. Only a few individual children used any form of aggression. Aggression did not tend to occur more frequently post-computer, but an exception to this trend was found in a case study of one child.

The observational data show that there were no major differences between the girls' and boys' social behaviour. When interviewed, the teachers also reported no perceived gender differences that were consistent across classes. There were very few indications in the teachers' diaries that boys and girls used the computer differently during the first term the computers were in use. However, three of the four teachers mentioned that after the children became more used to the computers (when the computers had been in the learning environment for 2 school terms) there was a tendency for some of the boys to become the more eager users. Therefore, although both computer use and behaviour at the computer were fairly similar initially, some of the teachers' comments suggest that ongoing teacher intervention may be necessary if girls and boys are to have equal access to computing experience.

The teachers' comments about social interaction suggest that the

children were unconcerned about who was using the computer with them, and that they were co-operative when waiting for turns. These impressions show some consistency with Muller and Perlmutter's (1985) finding that active sharing and turn taking occurred among 4- and 5-year-old children using computers.

It is likely that adult involvement and initial planning helped here. The baseline phase of the study allowed the teachers some time to think about management strategies. The higher incidence of children's Asking Adult for Help post-computer certainly suggests that there is an increased need for teacher involvement and support when microcomputers are introduced to early education settings. From the teachers' comments, it was evident that there were some problems associated with the type of software available for the Commodore 64 computer. However, as the courseware reviews show, they did find that some programs were quite suitable.

Other management issues arising from this study concern physical arrangements within the learning environments, and the teachers' workloads. In the early weeks of the study, safe storage and movement of the computers were sources of anxiety or inconvenience for the teachers. This suggests the need for prior planning and budgeting for adequate trolleys and storage arrangements. To minimize the increase in teachers' workloads post-computer, it helped these teachers to attend a computing course and to practice with the programs at home before the computers were introduced. Time constraints during classroom periods or kindergarten sessions, resulting in part from the children's asking adults for help more frequently, were not solved spontaneously by parent helping. Although many of the parents were in favour of having computers in the classroom, there was a low incidence of parental involvement, particularly in the junior school classes.

The teachers recommended much of the courseware they were using, but they did express specific reservations in some reviews. Detailed reviews of the courseware are presented in Appendix A.

Courseware recommended by both the kindergarten and the school teachers included Alpha Build, Print Shop, Stickers, the Sticky Bear series, Muppet Learning Keys, and Micro Illustrator. The kindergarten teachers also recommended Facemaker, Memory Manor, and Early Games; courseware which was used only with the kindergarten aged children. Courseware used only in the junior school and recommended by the teachers there included Boppie's Great Word Chase, Write Now, and Moving Pictures.

Other courseware was also recommended, but the teachers' reviews contained several rather negative comments. This courseware included Make a Match, Corner Store, Getting Ready to Read and Add, and Big Bird's Special

Delivery.

The teachers expressed stronger reservations about two of the courseware packages. Tally and Total, which was evaluated by both the school and the kindergarten teachers, and Sea Speller, which was used only in the junior school classes, both received unfavourable comments.

In summary, this study has shown that introducing microcomputers to classrooms and kindergartens was associated with increased social interaction, most notably in child-child talk about the task at hand. There were some individual differences in the extent to which the children enjoyed computing activities. Management issues associated with having computers in kindergartens and junior school classes were described, and the teachers' recommendations were documented. The research suggests that microcomputers may enhance young children's socialization, although detailed planning is required when microcomputers are introduced to their learning environments. These findings were generally consistent across the two kindergartens and two junior school classes, and they seem likely to be generalizable to other early childhood centres.

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APPENDIX A

COURSEWARE EVALUATIONS

The teachers evaluated much of the courseware as effective and relevant to New Zealand education, although they did mention that 'Americanisms' were quite prevalent. They reported, unless otherwise stated, the courseware was appropriate as regards: rate of presentation; sequence of presentation; rate of repetition; level of difficulty; accuracy of content; and freedom from sex and race bias.

Information from the reviews is summarised in the following sections. When the children's motivation is described, details of the children's own views are also included. These data were obtained when the children were interviewed in December 1986.

Courseware Recommended as Effective

Alpha Build

COURSEWARE TITLE:	Alpha Build
SUBJECT:	Language
TOPIC	Alphabet
INTENDED TARGET GROUP:	Ages 4-8 years
SINGLE OR ONE OF A SERIES:	Single
CLASSROOM RUNNING TIME:	Open ended
COMPUTER SYSTEM(S):	Commodore 64
PERIPHERALS REQUIRED:	Joystick
NUMBER OF DISKS:	-- (Cartridge)
YEAR OF DEVELOPMENT:	1984
SOURCE:	Fisher-Price
AUTHORS:	Childware Corporation
	copyright
COST:	$49.95 (pre-GST-relatively cheap)

Description

Alpha Build is designed to assist children's recognition and sorting of the letters of the alphabet. Letters are displayed in upper case and lower case boxes. Children use the joystick to move the figure of a penguin. The penguin climbs a ladder, picks up a letter, and drops it down a chute on to a truck. There are eight levels of difficulty. Upper and lower case letters are matched, words are made, then letters of words flash on and off requiring the child to remember a letter.

Curriculum Applications

The teachers described the courseware type as drill-and-practice, involving some problem solving and information retrieval. Junior school teachers also thought Alpha Build could have a remedial function for some older children. All teachers thought the rate of repetition and number of examples given, and the feedback were appropriate for children aged 4 to 8. Alpha Build was

judged suitable for small group use or individual use. Once the child was familiar with the program, teacher involvement was needed only to change the level of difficulty.

The kindergarten teachers specified 'manipulation, hand-eye co-ordination, language and alphabet' as skills that Alpha Build may develop. The junior school teachers listed similar skills and considered the courseware relevant to the curriculum because it reinforces the alphabet, and includes upper and lower case letters and four-letter words. The only disadvantage identified by the teachers was that 'limited skills' were needed, and that 'the chutes accept both upper and lower case letters.'

Children's Motivation

All four teachers judged Alpha Build as effective from the user's point of view. Although user control of the courseware was rated as limited, they commented that the level of difficulty could be changed. The directions and screen prompts were considered clear and consistent, and the tone of communications was described as friendly. They noted that the program responds to inappropriate input (but does not 'crash') and assists appropriately in response to inaccurate input. The teachers thought the special effects were both instructionally functional and decorative. ('Bright colours, interesting', 'very exciting and motivating'.) They described Alpha Build as user friendly, with effective interaction between the courseware and the user. Non-essential sound effects could be turned off, when and how to respond was always made clear to the user, but the user was not able to review directions if necessary.

The teachers responded enthusiastically about Alpha Build's motivating qualities:

> 'Neat! Adults don't lose interest. Motivating. A really good program. Have used it in the kindergarten for a year and it still holds children's interest.' 'Highly recommended. Very popular with the children... Interesting and stimulating. (They) like the trucks.'
> (Kindergarten teachers, 7/4/87)

> 'Really exciting, stimulating, and visually appealing. Easy way to learn because it's motivating.' Interesting and stimulating - positive reinforcement, cute characters - jovial.'
> (Junior school teachers, 7/4/87)

When the children were asked about specific likes and dislikes in regard to the computer, their views on Alpha Build were usually consistent with the teachers' comments. Among the school children, Alpha Build was mentioned more frequently than any other courseware as something they liked about computers. The questions 'What do you like about the computer,' and 'What else do you like about the computer?' brought a total of 52 software-related responses from the school children, and of these, 22 (42%) were 'Alpha Build'. A smaller number of kindergarten children (5 of the 51 courseware responses) favoured Alpha Build. One kindergarten child mentioned Alpha Build as something she disliked.

Overall, Alpha Build was clearly favoured by the school children and their teachers. The kindergarten teachers also recommended this courseware.

Print Shop

COURSEWARE TITLE:	Print Shop
SUBJECT:	Language Based
TOPIC:	Anything
INTENDED TARGET GROUP:	Any age
SINGLE OR ONE OF A SERIES:	Single
CLASSROOM RUNNING TIME:	15 minutes to set up and produce an item
COMPUTER SYSTEM(S):	Commodore 64, Apple II, IBM, Atari
PERIPHERALS REQUIRED:	Printer, disk drive
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1977
SOURCE:	Broderbund Software
AUTHOR(S):	David Balsam
COST:	Reasonable

Description

The teachers described Print Shop as an 'easy-to-use program that lets you view, select, and assemble the various elements of a personalized decorative message, and print it on your regular computer paper.' They identified the courseware type as information retrieval, and the computer's role as a tool for the user. Flexible use was considered characteristic, as Print Shop includes different degrees of difficulty and several different concepts or skills. The teachers thought Print Shop was suitable for individual use or classroom demonstration, and that constant teacher involvement was needed.

Curriculum Applications

Print Shop was evaluated as having a variety of applications. It was used for language related activities like writing cards and signs. The teachers also described this courseware as being 'adaptable to any area of the curriculum,' through its emphasis on choosing applicable words and graphics and following instructions. The school teachers thought this courseware provided 'a great complement' to other teaching methods. Language used in Print Shop was accurate, but all four teachers mentioned an 'American bias'. The program was 'crash-proof', and it was possible to make back-up copies of the disk.

On their courseware evaluation forms and in their diaries, the teachers

expressed some reservations about the creative potential of Print Shop. However, although they described the graphics as 'stylized' (the children cannot create their own pictures), all of the teachers thought Print Shop did have scope to stimulate ideas: 'they can apply what they've done to other things they design off the computer.'

Children's Motivation

The teachers all found this courseware was interesting for the children: 'A very interesting activity because the children can take home what they have created'. From the user's point of view, they described Print Shop as flexible and 'user-friendly' with a neutral tone of communications, clear directions and screen prompts, and appropriate assistance in response to inaccurate input. They considered the special effects were both instructionally functional and decorative. When and how to respond was made clear to the user, the text was presented in brief, easy-to-read blocks, diagrams were functional, and there was effective interaction between the courseware and the user.

All of the teachers thought Print Shop was motivating because it offered 'positive reinforcement' in the form of something for the children to keep, with names in print. They thought Print Shop was useful for special occasions like birthdays. Being 'personalized' and producing a 'tangible result' were some of the advantages'.

> 'Excellent for children to create something but with their own personal touch added... Classroom signs can be created (as opposed to teacher-made ones)'.
> 'Shows how commercial things are printed (on a simple level)'.
> (Junior School Teachers, 23/4/87)

> 'Highly motivating and enjoyable'.
> (Kindergarten Teachers, 23/4/87)

When interviewed two terms after the computer was installed, one child from the school and two children from the kindergartens mentioned making cards or using Print Shop as an activity they enjoyed on the computer. The rather low number of responses favouring Print Shop (3 from a total of 103 software-related responses) may suggest that most children did not think of Print Shop as especially exciting courseware. Alternatively, the low number of responses here could be attributable to the infrequent 'special occasion' use of Print Shop in the classrooms and kindergartens. It is interesting to

note that none of the children named Print Shop or making cards as something they disliked about computers.

Advantages and Disadvantages

In summary, the teachers listed a number of advantages of Print Shop, particularly with regard to the children's motivation and learning. However, both the kindergarten and the junior school teachers did mention time and the need for teacher assistance as disadvantages of this courseware. As the classroom running time was 15 minutes on the Commodore 64, the teachers commented that Print Shop is 'very time consuming if everyone in the class is to have a turn.' They also found that an adult was needed to operate disk drive changes and the printer: 'constant assistance is required'. Another disadvantage could be that Print Shop produces text in upper case letters only. The school teachers thought that Print Shop was 'extremely time consuming - but worth it!'

Stickers

COURSEWARE TITLE:	Stickers
SUBJECT:	Mathematics
TOPIC:	Multiple (geometry, six, shape, colour, rotation)
INTENDED TARGET GROUP:	4 to 12 years
SINGLE OR ONE OF A SERIES:	Single
CLASSROOM RUNNING TIME:	Unending
COMPUTER SYSTEM(S):	Apple II, IBM, Commodore 64
PERIPHERALS REQUIRED:	Disk drive, joystick
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1984
SOURCE:	Springboard Software Inc.
AUTHOR(S)	-
COST:	$70.00 NZ (pre-GST) - moderate

Description

The teachers described the courseware content and flow in this way:

> 'Stickers provides a choice of picture outlines (stickers) to colour and fill in according to shape and size and rotation of shape necessary. Children use the joystick to move shapes and select icons (options). (There are) varying levels of difficulty leading up to creating an entire picture. Continuous flow.'

They described the courseware type as tutorial, drill-and-practice, and problem solving, and they viewed Stickers as suitable for small group or individual use. Little or occasional teacher involvement was needed.

Curriculum Applications

The teachers thought Stickers had a variety of applications. Flexible use was possible because this courseware featured several different concepts or skills, different degrees of difficulty, and allowed different learners to be treated in different ways. When children used Stickers, the computer's role was that of a tutor. The teachers saw Stickers as having 'excellent overall curriculum content' - relevant to language, mathematics, and art. The

kindergarten teachers, however, described this courseware as 'ideal for the whole school - less use in kindergarten'.

The two junior school teachers, who evaluated the content as 'excellent', thought Stickers 'consolidates' learning even though it does not offer a learning/teaching opportunity that would not otherwise be feasible. They judged the feedback and support materials as appropriate. However, the program was not 'crash-proof' as it 'goes back to picture menu' where 'the picture can be wiped'.

Children's Motivation

All four teachers thought Stickers was challenging and rewarding. Children could create their own pictures, and the content could be 'visually attractive if the user desires'. User control of the courseware was considered to have some limitations, but with having changeable levels, there was also some flexibility and diversity. Directions, screen prompts, and the instruction book were clear. The teachers evaluated the assistance given in response to inaccurate input as minimal, and they noted that the responses to inappropriate input included a high tone for 'correct' and a low tone for 'incorrect'. They rated the tone of communications neutral and the special effects as instructionally functional. From the user's point of view, the directions could be reviewed, the text presentation was judged excellent, the courseware could be described as user friendly and there was effective communication between the courseware and the user. The teachers all thought the courseware motivated the user and that the completed picture was rewarding.

One kindergarten child and three school children named Stickers as something they they liked about computers. None of the children responded that he/she disliked Stickers.

Muppet Learning Keys

COURSEWARE TITLE:	Muppet Learning Keys
SUBJECT:	Language
TOPIC:	Alphabet
INTENDED TARGET GROUP:	4-7 years
SINGLE OR ONE OF A SERIES:	Single
CLASSROOM RUNNING TIME:	Indefinite
COMPUTER SYSTEMS:	Commodore 64/Apple II
PERIPHERALS REQUIRED:	Touch pad
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1984
SOURCE:	Koala Technologies Corporation (Copyright)
AUTHOR:	Michael Firth
COST ($NZ):	Expensive" - $275 (Pre-GST)

Description

Kermit the Frog introduces young children to using the computer and to the Muppet Learning Keys. There are three stages: discovery, letters, and numbers.

Curriculum Applications

The teachers described the courseware type as being potentially tutorial, drill and practice, remedial, and a game. They all evaluated Muppet Learning Keys as 'applicable with modification' to New Zealand education, noting that there were 'American terms'. They considered the courseware had restricted rather than varied applications to the curriculum, that it allowed different learners to be treated in different ways, that no teacher involvement was needed, that the application was suitable for small group use, and that the computer's role was that of a tool for the user.

The teachers also thought that Muppet Learning Keys was 'crash-proof'. It had accurate content and valid concepts, appropriate sequence and rate of presentation, and appropriate feedback. The kindergarten teachers commented, though, that after pressing the wrong key it took a long time to load and

reload. Children of pre-school age needed extra help from adults if they were to move on to the number and letter sequence.

Children's Motivation

Looking at Muppet Learning Keys from the user's point of view, the four teachers rated the directions and screen prompts as clear and consistent, and the tone of communications as friendly. They described user control of the courseware as limited and the required reading ability as low. The program's response to inappropriate input was to ignore it; the response to inaccurate input was to assist minimally.

They thought the user was able to review the directions if necessary, that 'when and how to respond' was always made clear to the user, that the text was presented in brief, easy-to-read blocks, that non-essential sound effects could be turned off, and that the courseware was 'user friendly' with effective interaction between the courseware and the user.

All of the teachers felt that the Muppet Learning Keys motivated the user. For example:

> 'A very exciting and motivating program which reinforces numbers and the alphabet'.
> (Junior School Teachers, 23/4/87)

However, they did express some reservations about the impact of this program on creativity, and about its use of American language. The school teachers felt Muppet Learning Keys had limited challenge, because the content was restricted to the alphabet A to Z and the numbers 1 to 10. They are also noted, though, that 'this doesn't seem to hinder motivation'.

Among the school children, Muppet Learning Keys was the second most popular courseware (see Table A.1). When asked what they liked about the computer, 11 (21%) of the school children and 2 (4%) of the kindergarten children mentioned 'the Muppet program'. None of the children mentioned Muppet Learning Keys as something they disliked.

Micro Illustrator

COURSEWARE TITLE:	Micro Illustrator
SUBJECT:	Mathematics
TOPIC:	Drawing
INTENDED TARGET GROUP:	Any age
SINGLE OR ONE OF A SERIES:	Single
CLASSROOM RUNNING TIME:	Indefinite
COMPUTER SYSTEMS(S):	Commodore 64
PERIPHERALS REQUIRED:	Joystick
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1984
SOURCE:	Commodore Business Machines (Copyright)
AUTHOR(S):	-
COST ($NZ):	$70-80 (pre-GST)

Description

Micro Illustrator gives 'the artist who likes using a computer experimentation with art. An easy-to-use but powerful graphics tool'. The screen display is manipulated with a joystick.

Curriculum Applications

All four teachers described the courseware type as electronic blackboard and problem solving. They rated Micro Illustrator as very applicable to New Zealand education, with a variety of applications including art and mathematics. The computer's role was seen as a tool for the user. The teachers evaluated the courseware as flexible because it includes several different concepts or skills, different degrees of difficulty, and it allows different learners to be treated in different ways. They thought that after an initial introduction, no teacher involvement was necessary, and that the application was suitable for small group or individual use.

According to both the kindergarten and the school teachers, the feedback was appropriate for the intended audience. They decided that the courseware would be suitable for older children too, and that there was an appropriate user evaluation component. The teachers judged the support materials adequate,

the program 'crash-proof', and they noted that it was possible to make back-up copies of the disk. Although they thought the courseware offered an improvement over other teaching methods in that it provided 'another medium', they did not find that the courseware offered a possible teaching/learning opportunity that would not otherwise be feasible.

Additional comments made by the kindergarten teachers were very positive:

> 'This is an excellent program because of its open-ended approach. It has plenty of scope and extension possibilities. A well designed program. Can be applied across the curriculum. Excellent potential for developing eye-hand co-ordination, colour and shape discrimination, problem solving, design...'
> (Kindergarten teachers, 11/8/87)

The two school teachers made similarly enthusiastic comments about curriculum applications:

> 'Emphasizes the process rather than the product. Excellent program suitable for all ages to consolidate any curriculum area or to use as a means of teaching techniques in design and drawing. Open-ended, allowing for lots of versatility'.
> (Junior School teachers, 11/8/87)

Children's Motivation

All four teachers described user control of the courseware as flexible, the directions and screen prompts as clear and consistent, and the tone of communications as friendly. They found that the courseware responded to inappropriate input and assisted minimally in response to inaccurate input. They thought low reading ability was required at the suggested age level, and the special effects were instructionally functional and decorative. From the user's point of view, the directions could be reviewed if necessary, when and how to respond was always made clear, the diagrams were functional and meaningfully labelled, there was effective interaction between the courseware and the user. Although all teachers thought the courseware motivated the user, the school teachers made more positive comments about this:

> 'Very rewarding program that involves children in decision making, problem-solving techniques'.

They found that older (J2, J3) children persisted at the task for longer than younger (J1) children:

> 'Older children became quite involved and enjoy the options. They

extend their ideas all the time'.
(Junior school teachers 11/8/87)

As the kindergarten teachers found, younger children were more inclined to give up, but some persisted:

'When given help they are able to stick with it. Once children have mastered the process they really enjoy the scope of program'.
(Kindergarten teachers 11/8/87)

All of the teachers commented that it would be more motivating if the children were able to print out the end product. They wrote that 'storing can be done, on another disk, but no print out'.

Although none of the children specified Micro Illustrator as something they liked or disliked about computers, several mentioned drawing as something they liked, and one child from the kindergarten sample said 'drawing with the handle'.

The Sticky Bear Series

School Sample

COURSEWARE TITLE:	Sticky Bear Reading
SUBJECT:	Reading
TOPIC:	Word Skills
INTENDED TARGET GROUP:	Ages 5-8
SINGLE OR ONE OF A SERIES:	Series
CLASSROOM RUNNING TIME:	Runs through own course
COMPUTER SYSTEM(S):	Commodore 64, Apple II, IBM
PERIPHERALS REQUIRED:	Joystick
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1984
SOURCE:	Optimum Resources Ins. (Copyright)
AUTHORS:	R. Hefter & S. Worthington
COST ($NZ):	-

Description

The four teachers described Sticky Bear Reading as having 'lots of word-picture sets for plenty of vocabulary building.' Animation turns the words in a sentence into live action. The child can create sentences and watch them turn into animated pictures. Although the children have no control over the flow of the program, they are able to change the games at any stage.

Curriculum Applications

The teachers categorized the courseware type as both tutorial and drill and practice. They thought Sticky Bear Reading was very applicable to the New Zealand curriculum, but it had restricted applications. The courseware featured different degrees of difficulty and allowed different learners to be treated in different ways. Little teacher involvement was needed, and the application was most suitable for small group use. The teachers evaluated the feedback as appropriate for the intended audience, and the program as crash proof. They did not think Sticky Bear Reading offered an improvement over other teaching methods or a learning/teaching opportunity which would not otherwise be feasible.

Children's Motivation

The teachers decided that, from the children's point of view, user control was limited, the reading ability required at the suggested age level was average to high, the directions and screen prompts were clear and consistent, and the tone of communications was friendly. The program responded to inappropriate input with a 'high pitched friendly sound', and assisted appropriately in response to inaccurate input.

They thought this courseware was motivating for the able reader. The children could review directions if necessary, it was clear when and how to respond, there was effective interaction between the courseware and the user, and the diagrams were functional. Although they considered the text was presented in clear, easy-to-read blocks, they rated the special effects as distracting, commenting that the children 'need to read the sentence and watch the picture at the same time.'

Among the school children themselves, there was some enthusiasm about the Sticky Bear Series, but more particularly about Sticky Bear Shapes.

Sticky Bear Shapes

COURSEWARE TITLE:	Sticky Bear Shapes
SUBJECT:	Mathematics
TOPIC:	Shapes
INTENDED TARGET GROUP:	Ages 3-6
SINGLE OR ONE OF A SERIES:	Series
CLASSROOM RUNNING TIME:	Runs its own course
COMPUTER SYSTEM(S):	Commodore 64, Apple II
PERIPHERALS REQUIRED:	Joystick (or keyboard)
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1984
SOURCE:	Optimum Resources Inc. (Copyright)
AUTHOR(S):	R. Hefter & S. Worthington
COST:	$80-90 (pre-GST)

Description

Sticky Bear Shapes identifies five common geometric shapes. There are three games: 'Pick it' identifies missing shapes in each picture; 'Name it' matches shapes with their names; 'Find it' matches a sample shape with one hidden in each picture. There is no control over the flow of this courseware. The two school teachers found that the pictures changed rather slowly, but the games could be changed at any time.

Curriculum Applications

The teachers thought Sticky Bear Shapes had a variety of curriculum applications. They described the courseware type as drill and practice and the computer's role as that of tutee for the user. They found no teacher involvement was necessary once the children were initiated. They saw the application as suitable for small group use, individual use and classroom demonstration. As in the case of Sticky Bear Reading, they responded positively on the review form about the courseware content and appropriateness for the intended audience.

They thought Sticky Bear Shapes did offer an improvement over other teaching methods, mainly by reinforcing the concept of shapes. However, they did not think this courseware offered a learning/teaching opportunity that would not otherwise be feasible. The teachers responded positively about the user evaluation component and the support materials and documentation, adding 'Good:' in each case. From the teachers' point of view, they also commented:

> 'Very rewarding if correct, but quite negative if wrong ... The children tend to make correct choices ... Colourful and a lot of movement which keeps children's attention. Loading (the) program is time consuming'.
> (Junior School teachers, 9/6/87).

Children's Motivation

The teachers evaluated user control of the courseware as limited, 'but still interesting'. They thought low reading ability was required at the suggested age level. There was a response to inappropriate input, and minimal assistance was given in response to inaccurate input. They rated the tone of communications as friendly or neutral, and the special effects as both instructionally functional and appealingly decorative. They responded positively to all questions about user motivation and courseware presentation, commenting

> 'Attractive and highly motivating. Easy to understand the instructions by themselves. Reinforces shapes very well. Friendly, because it responds to correct choices with music and movement'.
> (Junior School teachers, 9/6/87).

Of the 52 school children who named specific courseware as things they liked about computers, 10 (19%) named Sticky Bears, with 4 of these saying more specifically 'Sticky Bear Shapes'.

The Sticky Bear Series

Kindergarten Sample

COURSEWARE TITLE:	Sticky Bear opposites
SUBJECT:	Concept of opposites
TOPIC:	Opposites
INTENDED TARGET GROUP:	Ages 3-6
SINGLE OR ONE OF A SERIES:	Series
CLASSROOM RUNNING TIME:	Endless
COMPUTER SYSTEMS:	Commodore, Apple
PERIPHERALS REQUIRED:	-
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1984
SOURCE:	Optimum Resources Inc. (Copyright)
AUTHORS:	R. Hefter & S.Worthington
COST:	$80 - $90 (pre GST)

Description

There are numerous sets of pictures. Sets of pictures are changed by pressing the space bar. Within a set, opposite pictures can be summoned by pressing two keys: the cursors, O and P, or 1 and 2.

Curriculum Applications

The kindergarten teachers described this courseware as a game, problem solving, drill and practice, tutorial, and remedial. They found Sticky Bear Opposites very applicable to New Zealand education, but it had restricted applications (concepts of opposites only). The computers' role was seen as 'tutor of the user' and they thought flexibility of use was limited. Little teacher involvement was needed, just a few minutes to run through the instructions. The application was suitable for small group use or individual use and the feedback appropriate.

The teachers did not think though, that Sticky Bear Opposites offered an improvement over other teaching methods or a teaching/learning opportunity which would not otherwise be feasible. They did suggest that this courseware could also be used for older children with 'special needs-slow learners'. They commented that it was an excellent program for starting children on the

computer.

Children's Motivation

From the user's perspective, the teachers described user control as limited. Required reading ability was average ('one word'), directions and screen prompts were clear and consistent, and tone of communications was friendly. They judged the response to inaccurate input as 'assists minimally', and noted that the courseware did respond to inappropriate input. Special effects were instructionally functional, but when and how to respond was not always made clear to the user. Otherwise they thought there was effective interaction between the courseware and the children, and the courseware could be described as 'user friendly' and motivating. They commented,

> 'Children enjoy using the program, learning through playing.
> 'A very good activity program, with ease of use. No real disadvantages. Colourful, good sound, slow moving - (the children are) able to go at their own pace'.
> (Kindergarten teachers 9/6/87).

Five kindergarten children named Sticky Bears (either opposites or numbers) as something they liked about computers, and none of the children mentioned the Sticky Bears series as something they disliked.

COURSEWARE TITLE:	Sticky Bear Numbers
SUBJECT:	Counting
TOPIC:	Number skills
INTENDED TARGET GROUP:	Age 3-5
SINGLE OR ONE OF A SERIES:	Series
CLASSROOM RUNNING TIME:	As long as required
COMPUTER SYSTEMS:	Commodore 64, Apple II, IBM
PERIPHERALS REQUIRED:	-
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1984
SOURCE:	Optimum Resources Inc.
AUTHOR(S):	Weekly Reader Family Software (Copyright)
COST ($NZ):	$80-$90 (pre GST)

Description

Sticky Bear Numbers is a counting and number recognition computer program. The teachers gave these examples of the courseware content and flow: 'Press number 4 and a graphic show of 4 objects moving around the screen will appear. The space bar can also be used to count from 0 to 9. Each time a number is pressed, a new set of pictures will be displayed.' They thought the program flowed well.

Curriculum Applications

The kindergarten teachers described Sticky Bear Numbers as tutorial, drill and practice, problem solving, and a game. They thought the courseware was applicable to New Zealand education, with restricted applications (number work). As with Sticky Bear Opposites, for Sticky Bear Numbers the computer's role was that of a tutor, flexibility of use was limited, little teacher involvement was needed, and the application was suitable for small group or individual use. The teachers' views of this courseware were essentially similar to their evaluation of Sticky Bear Opposites.

Children's Motivation

From the user's point of view, the teachers noted that Sticky Bear Numbers required low reading ability; only numbers were required. The program ignored inappropriate input. Otherwise, their evaluation of this courseware was the same as Sticky Bear Opposites. They thought Sticky Bear Numbers was user friendly. They described the sound as acceptable, although it was possible to turn off non-essential sound effects. The teachers commented:

> 'Clear, colourful graphics. Good sound - appealing and easy to use. ... No sense of failure but also no reward'.
> (Kindergarten teachers, 9/6/87).

Advantages and Disadvantages

However, they commented that the older kindergarten children did not find Sticky Bears Opposites or Sticky Bears Numbers challenging. This courseware was very structured with 'no creative extension'. Sticky Bear Numbers also took a long time to load, but this was an 'excellent' and 'attractively presented' program for 'teaching basic numbers'.

Facemaker

COURSEWARE:	Facemaker
SUBJECT:	Basic Computer Skills
TOPIC:	Memory
INTENDED TARGET GROUP:	4 years +
CLASSROOM RUNNING TIME:	Unlimited
COMPUTER SYSTEMS:	Apple II, IBM, Atari, Commodore 64
PERIPHERALS REQUIRED:	-
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1983
SOURCE:	Spinnaker (copyright 1983)
AUTHORS:	Design Ware
COST ($NZ):	$49 (pre GST)

Description

The kindergarten teachers described Facemaker as courseware with appropriate stages, which included 'build', 'program', and 'game'.

Curriculum Applications

The teachers rated this courseware as student-utility type, and a game involving some drill and practice. Memory, decision making, and the alphabet were involved, and they thought Facemaker had a variety of applications, with several different concepts or skills and several levels of difficulty. Facemaker was used mainly individually, but it was also suitable for small group use. After the program was set up, little teacher involvement was needed. The program was evaluated as 'crash proof', with adequate documentation and support materials. The courseware did not offer a teaching/learning opportunity which would not otherwise be feasible.

Children's Motivation

The teachers commented that Facemaker was easy to set up and that the children would ask for this program. They found it a suitable program for introducing children to the computer: 'It provides for skill with computer fundamentals such as menus, cursors, the return key, the space bar, and graphics'.

(Kindergarten teachers, 9/6/87). Directions and screen prompts were considered clear. Communications were neutral in tone, and Facemaker was described as 'user friendly'.

The teachers rated Facemaker as 'motivating' but they mentioned that the children tended to be 'put off by the tongue poking out when they get the game wrong'. The first two stages were non-judgemental, but the negative judgement (tongue poking out) occurred in the third stage.

Facemaker was the courseware most frequently named by the kindergarten children in regard to 'likes' about the computer, with 14 (28%) of the children naming Facemaker (see Table A.1). However, in response to the question about dislikes, one kindergarten child replied 'I don't like the Faces'.

Memory Manor

COURSEWARE TITLE:	Memory Manor
SUBJECT:	Learning skills
TOPIC:	Visual memory
INTENDED TARGET GROUP:	Ages 4-8 years
SINGLE OR ONE OF A SERIES:	Single
CLASSROOM RUNNING TIME:	Indefinite
COMPUTER SYSTEM(S):	Commodore 64
PERIPHERALS REQUIRED:	Joystick
NUMBER OF DISKS:	Cartridge
YEAR OF DEVELOPMENT:	1984
SOURCE:	Fisher-Price
AUTHOR(S):	Frieda Lekkerberker (copyright)
COST:	$39 (pre GST)

Description

The children use the joystick to move a helicopter around a picture of a building. By pressing the joystick button, buckets are filled with water and a man fills a sponge from the bucket. The aim is to wash windows which have pictures, and points are given for correct memory of pictures. There are three levels of difficulty.

Curriculum Applications

The two kindergarten teachers described this courseware type as problem solving and a game. They judged the program as very applicable to New Zealand education, with a variety of applications. They considered this courseware was flexible, with several different concepts or skills, and different degrees of difficulty. Little teacher involvement was needed, and the application was seen as suitable for small group use or individual use. The teachers judged the feedback, the user evaluation component, and the support materials, as appropriate. However, they did not think Memory Manor offered an improvement over other teaching methods or a learning opportunity that would not otherwise be possible. They thought the courseware developed children's memory skills, concentration, and eye-hand co-ordination.

Children's Motivation

The teachers described Memory Manor as

> 'A most enjoyable program for both children and adults. Lots of challenges. The children have a lot of concepts to grasp ... This program holds peoples' interest.'
> (Kindergarten teachers, 11/8/87).

From the user's point of view, they described the couresware as fixed, required reading ability as low, and the directions and prompts as clear and consistent. The program responded to inappropriate input, and assisted appropriately in response to inaccurate input. They thought the tone of communications was friendly or neutral, the courseware was user friendly and motivated the user, and the diagrams were functional and meaningfully labelled. Special effects were both instructionally functional and decorative, and it was possible to turn off non-essential sound effects. Different sounds and faces served as feedback, for example a 'grumpy' face appeared when the sponge did not require filling. However, they described this feedback as 'not offensive and can be quite fun'.

Five of the kindergarten children named Memory Manor or 'washing the windows' as something they liked about computers, and no child mentioned this courseware as a dislike.

Early Games

COURSEWARE TITLE:	Early Games
SUBJECT:	Language and Mathematics
TOPIC:	Alphabet, shapes, letter and number recognition
INTENDED TARGET GROUP:	3 to 6 years
SINGLE:	Series (Springboard Early Games)
CLASSROOM RUNNING TIME:	Limitless
COMPUTER SYSTEM(S):	Commodore 64
PERIPHERALS USED:	Optional joystick
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1985
SOURCE:	Springboard (Back-up disks available on request)
COST:	$70-80 (Pre-GST)

Description

There is a choice of nine different games to select through the menu. Games include matching numbers, counting blocks, adding blocks, subtracting blocks, matching letters, alphabet sequence, writing names, drawing, and comparing shapes.

Curriculum Applications

The teachers described the courseware type as tutorial, drill and practice, remedial, and a game. They rated Early Games as very applicable to New Zealand education (kindergarten level), with a variety of applications. The computer's role was described as both tutor and tool of the user. Flexibility of use was a feature of the courseware, because the program included different degrees of difficulty and several different concepts and skills. Once the program was set up, little teacher involvement was needed and the application was suitable for small group or individual use.

The kindergarten teachers felt that Early Games did not offer an improvement over other teaching methods or offer a possible teaching/learning opportunity which would not otherwise be feasible. The program was considered crashproof, and easily absorbed into kindergarten routine.

Children's Motivation

The teachers judged user control of the courseware as limited, the reading level required as controllable, the directions and screen prompts as clear and consistent, and the tone of communications as friendly. From the user's point of view, they rated the program's responses to inaccurate input favourably, and noted that the program responded (rather than ignoring or crashing) when the input was inaccurate. They thought the special effects (colour, sound, animation) were instructionally functional but sometimes distracting. They responded positively to questions about the motivating characteristics of Early Games, and wrote:

> 'Children enjoy the games. Functional, easily learnt in most cases'. 'Child has the opportunity for creative drawing in 'Picture Draw'.' 'Children can choose which activity they wish to use.' (Kindergarten Teachers, 20/8/87)

Early Games received some positive comment from the kindergarten children. In response to the interview questions about specific likes and dislikes regarding computers, 7 kindergarten (14% of the software-related responses) named Early Games as something they liked (see Table A.1). One child mentioned one of the games as something she disliked.

Easy as ABC

COURSEWARE TITLE:	Easy as ABC
SUBJECT:	Language
TOPIC:	Alphabet, letter recognition
INTENDED TARGET GROUP:	Ages 3-6 years
SINGLE OR ONE OF A SERIES:	Series (Early Games Series)
CLASSROOM RUNNING TIME:	Indefinite
COMPUTER SYSTEM(S):	Apple II, Macintosh, Commodore 64, IBM
PERIPHERALS REQUIRED:	Joystick
NUMBER OF DISK DRIVES:	One
YEAR OF DEVELOPMENT:	1985
SOURCE:	Springboard Software Inc (copyright-replacement disks available)
AUTHORS (if known):	-
COST ($NZ):	$70-$80 (pre-GST)

Description

These games are designed to develop children's letter recognition, their knowledge of alphabetical order, and their matching of upper and lower case letters. Letters are associated with sounds and the children are encouraged to discover how letters of the alphabet combine to form words.

Curriculum Applications

The kindergarten teachers identified the courseware type as tutorial ('in an acceptable way'), drill and practice, problem solving, student utility, remedial, and a game. They rated the courseware as very applicable to New Zealand education, but they thought there were restricted applications. The role of the computer was that of tutor of the user and tool for the user. The teachers thought Easy as ABC was flexible in that there were several different concepts or skills and different degrees of difficulty. They thought little teacher involvement was needed 'once children learn how to advance', and that this courseware was suitable for small group use or individual use.

The teachers responded that the feedback was appropriate for the intended audience, and that there was a user evaluation component. They decided the courseware could be appropriate for an audience other than the intended one, and suggested it could be used with 'slower older learners'.

They found the support materials adequate, and judged the program 'crash-proof'. From the teacher's point of view, Easy as ABC was:

> 'An easily set up program with help required in initial stages only. Clear, basic illustrations, different degrees of difficulty, well presented, will teach children the alphabet in a series of five games that can be played without too much supervision'.
> (Kindergarten teachers, 20/8/87).

Children's Motivation

When evaluating user controls of the courseware, the teachers rated Easy as ABC as flexible. Letter recognition was the only reading skill required. They found that there was a 'very gentle' response to inappropriate input, and appropriate assistance in response to inaccurate input. The teachers thought that from the user's point of view the tone of communications was neutral, and the special effects were instructionally functional and decorative: 'gives hints in colour.' They judged that the user was able to review directions, that when and how to respond was made clear to the user, that the text was presented in brief, easy-to-read blocks, that the diagrams were functional and meaningfully labelled, that there was effective interaction between the courseware and the user, that the courseware could be described as 'user friendly', and they noted that it was possible to turn off non-essential sound effects. In their view, Easy as ABC did motivate the children:

> 'Very popular and children learn to interact with the computer. It's bright and easy to manage. Children become totally absorbed in the program'.
> (Kindergarten teachers, 20/8/87).

The teachers also commented that the children liked the variety offered by this courseware, and that the achievement was their reward. There were varying levels of achievement to sustain a challenge.

When the kindergarten children were interviewed, one child mentioned Easy as ABC as something liked about the computer, and none of the children mentioned this courseware as something disliked.

Overall Comment

The kindergarten teachers' overall comments about this 'activity' courseware were favourable:

'An excellent early childhood program. Basic learning skills, easily learnt, clearly set out, clear basic instructions. Basic games which are not complicated'.
(Kindergarten teachers, 20/8/87).

Kindercomp

COURSEWARE TITLE:	Kindercomp
SUBJECT:	Wide range-computer skills
TOPIC:	Drawing, experimentation with keyboard
INTENDED AGE GROUP:	Ages 3-8 years
SINGLE OR ONE OF A SERIES:	Series (Spinnaker)
CLASSROOM RUNNING TIME:	Endless
COMPUTER SYSTEM(S):	Commodore 64
PERIPHERALS REQUIRED:	Joystick
NUMBER OF DISKS:	Cartridge
YEAR OF DEVELOPMENT:	1983
SOURCE:	Spinnaker
AUTHOR(S):	Doug and Judy Davis
COST ($NZ):	$45.95 (pre-GST)

Description

The kindergarten teachers described Kindercomp as courseware designed for young children to experiment with the computer and develop keyboard skills. There are six options:

1: Draw - the child follows basic instructions and uses the joystick to achieve a picture.
2. Scribble - the user touches any key and the character appears on the screen in different forms.
3. Names - words are written and appear in different colours.
4. Sequence - numbers appear in a sequence, and the child fills in the missing number.
5. Letters - letters appear on screen and the child finds the letter on the keyboard.
6. Match - three patterns appear and the child matches patterns.

Curriculum Applications

Although the teachers thought the development of concepts was in line with New Zealand practice, they commented that some concepts were American. They responded negatively to questions about whether the courseware offered an improvement over other teaching methods, if the courseware offered a

learning/teaching opportunity which would not otherwise be feasible, if there was an appropriate user evaluation component, and if the courseware would be appropriate for an audience other than the intended one. However, they rated the feedback as appropriate for the intended audience, the support materials as adequate, and the program as 'crash-proof'. From the teacher's point of view they also commented:

> 'This is an excellent program for the pre-school child. Plenty of scope for experimentation and helping children to learn keyboard skills... The drawing sequence provides an open-ended opportunity to experiment. The other sequences are set and cannot be experimented with'.
> (Kindergarten teacher, 11/8/87)

Children's Motivation

The teachers rated user control of the courseware as limited, and reading ability required at the suggested age level as controllable. From the children's point of view, they thought the directions and screen prompts were clear. Inappropriate input was ignored, but there was appropriate assistance in response to inaccurate input. They rated the tone of communications as friendly and the special effects as both instructionally functional and decorative. The teachers decided that the user was able to review directions if necessary, that when and how to respond was always made clear to the user, that the text was presented in brief, easy-to-read blocks, that diagrams were functional and clearly labelled, and that there was effective interaction between the courseware and the user. They noted that it was possible to turn off non-essential sound effects and they described the courseware as 'user friendly' and motivating for the children:

> 'Children enjoy using this program, especially the drawing stage. Plenty of scope for choice, e.g. colour, method of drawing, erasing, changing colour, and speed. The other sequences are harder to pick up but (with help) they are able to work names and scribble ... Sequence and match are too complex for some pre-school children without adult help'.
> (Kindergarten teachers, 11/8/87)

When the kindergarten children were interviewed, none of them mentioned Kindercomp as something they liked about the computer. However, a few did say that they liked drawing at the computer.

Overall Comments

The teachers thought that, overall, this was a good program because it provides a wide range of activities and there is scope for both open-ended decision making (with drawing and words) and key board skills (in 'scribble' and 'sequence').

Boppie's Great Word Chase

COURSEWARE TITLE:	Boppie's Great Word Chase
SUBJECT:	Language
TOPIC:	Spelling
INTENDED TARGET GROUP:	Challenge to players of all ages.
SINGLE OR ONE OF A SERIES:	Single
CLASSROOM RUNNING TIME:	A few minutes per game
COMPUTER SYSTEM(S):	Commodore 64
PERIPHERALS REQUIRED:	Joystick
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1985
SOURCE:	D.L.M. (copyright 1985)
AUTHORS (if known):	-
COST ($NZ):	$60 (Pre-GST)

Description

Boppie's Great Word Chase uses a game format to assist children refine spelling and word recognition skills. The children guide the central character (Boppie) through a coloured maze to seek out letters and spell target words. There are 8 word lists, including a total of 250 words, with increasingly difficult mazes.

Curriculum Applications

The two teachers from the junior school classes described the courseware type as simulation and a game, with a spelling base and also a variety of applications to the curriculum. They thought that there was some flexibility of use, with different levels of difficulty and allowance for different learners to be treated in different ways. No teacher involvement was seen as necessary. The application was judged suitable for whole class use, small group use, and individual use.

The teachers also thought that Boppie's Great Word Chase offered an improvement over other teaching methods and a novel learning opportunity for learning to spell words. The feedback and the language used were considered appropriate, and the program was crash-proof. They commented that this courseware was:

'Good for "our" age J1, 2, 3 because it teaches how to spell basic 3- and 4-letter words but in an interesting way. It also allows for independent use by the children. Great!'
(Junior school teachers, 9/6/87)

Children's Motivation

When the two teachers evaluated Boppie's Great Word Chase from the user's point of view, they rated user control of the courseware as limited, the reading ability required as controllable ('caters for all levels'), the directions and screen prompts as clear and consistent, and the special effects as both instructionally functional and decorative. They thought the tone of communications was friendly, the response to inappropriate input was to assist minimally, and the courseware could be described as 'user friendly'. The teachers described the courseware as motivating for the user:

'Very motivating and exciting to look at - Boppie is appealing'.
'Exciting and stimulating presentation. Challenging for all ages'.

However, the children did not mention Boppie's Great Word Chase either as something liked or as something disliked about computers.

Advantages and Disadvantages

The teachers felt that the advantages of this courseware outweighed the disadvantages. Some advantages were the visual appeal, the effective help with spelling skills, and having an 'element of competition (if desired)'. The disadvantages were that the children sometimes were required to respond quickly; there were many things to be done, including frequent manipulation of the joystick; and the fact they 'they don't have to read the task word, just pick up the letters and put them in order', but 'this could also be an advantage in some cases'. The teachers' overall comments included:

'suitable for the whole school' and
'Highly recommended'.

Moving Pictures

COURSEWARE TITLE:	Moving Pictures
SUBJECT:	Reading-Language
TOPIC:	Story writing and appropriate illustration
INTENDED TARGET GROUP:	Ages 5-10 years
SINGLE OR ONE OF A SERIES:	Single
CLASSROOM RUNNING TIME:	10 minutes
COMPUTER SYSTEM(S):	Commodore 64
PERIPHERALS REQUIRED:	Joystick
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1985
SOURCE:	McGraw and Hill (Copyright)
AUTHOR(S):	-
COST ($NZ):	$15 (pre-GST)

Description

The user chooses from 6 backgrounds and 80 characters suited to each background. Characters can be enlarged, moving, or coloured, according to the child's choice. The child writes a story or caption related to the picture.

Curriculum Applications

The two junior school teachers identified the courseware type as drill and practice, electronic keyboard, and problem solving. They rated Moving Pictures as 'applicable with modification' to New Zealand education, and decided there was a variety of curriculum applications. In relation to flexibility of use, they noted that there were different degrees of difficulty. After an initial introduction, little teacher involvement was needed, and the application was suitable for individual or small group use. The teachers reported few problems from their point of view, apart from a lack of support materials and documentation.

They thought the courseware offered an improvement over other teaching methods in that it was another medium, and that the courseware did offer a learning/teaching opportunity that would not otherwise be feasible. They evaluated all aspects of the presentation as appropriate for the intended audience, including the feedback. The teachers found that the program was

'crash-proof' and that it was possible to make back up copies of the disk. They commented on the children's range of choices:

> 'Moving pictures involves many different operations for the children to remember... They have many choices to make before they even begin to write their story'.
> (Junior School teachers, 11/8/87)

Children's Motivation

The teachers described user control of the courseware as flexible. They thought average to high reading ability was required, and the directions and screen prompts were clear and consistent. Moving Pictures responded to inappropriate input, and assisted appropriately in response to inaccurate input. The tone of communications was rated as friendly, and special effects as both instructionally functional and decorative. The teachers also thought that the user was able to review directions if necessary, that when and how to respond was always made clear to the user, that the text was presented in brief, easy-to-read blocks and the diagrams were functional and meaningfully labelled, and that there was effective interaction between the courseware and the user. They described the courseware as "user friendly", and decided that Moving Pictures motivated the user. Non-essential sound effects could be turned off. They made these comments on the children's motivation and learning:

> 'Many different processes are involved but there are no right/wrong answers. They often have difficulty in deciding which character <u>really</u> belongs in which setting. Highly motivating but not always educational or producing detailed stories'.

In response to a question about sustained challenge to the children, the teachers wrote:

> 'The sustaining challenge would come from the endless possibilities of changing the character ... the placement of characters on the screen. Then, with encouragement they could create a story to go with it'.
> (Junior School teachers, 11/8/87)

When the children were interviewed, none of them specifically mentioned Moving Pictures.

Write Now

COURSEWARE TITLE:	Write Now
SUBJECT:	Reading and Language
TOPIC:	Money
INTENDED TARGET GROUP:	Ages 8-10
SINGLE OR ONE OF A SERIES:	Single
CLASSROOM RUNNING TIME:	10 minutes+
COMPUTER SYSTEMS:	Commodore 64
PERIPHERALS REQUIRED:	Printer
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1985
SOURCE:	McGraw-Hill (copyright)
AUTHORS:	-
COST ($NZ):	$15-$20 (pre-GST)

Description

Write Now is a simple word processing package.

Curriculum Applications

The junior school teachers categorized this courseware type as a student utility and electronic blackboard. They thought Write Now had a variety of applications for writing but restricted applications otherwise. The computer's role was that of a tool for the user, with flexible use allowing different learners to be treated in different ways. Much teacher involvement was needed with children younger than 8 years.

The teachers judged the application suitable for whole class use, small group use, individual use, or classroom demonstration. They decided that there was an appropriate user evaluation component, and the courseware would be appropriate for an audience other than the intended one. A major problem for the teachers and users was a lack of support materials and documentation:

> 'Instructions to this program are unavailable so it requires a lengthy process to discover function of keys'.
> (Junior School teachers, 11/8/87).

The teachers thought Write Now motivated the children who were 'good story writers', and they liked seeing their stories printed. Average to high reading ability was needed. From the user's point of view, directions and screen prompts were clear and consistent, there was a response to inappropriate input, and minimal assistance in response to inaccurate input. Special effects were instructional and decorative. However, the teachers responded negatively to questions about whether the user was able to review directions, if when and how to respond was always made clear, and whether there was effective interaction between the courseware and the user.

The children did not mention Write Now as something they liked or disliked about computers.

Make a Match

COURSEWARE TITLE:	Make a Match
SUBJECT:	Mathematics
TOPIC:	"One-to-one"
INTENDED TARGET GROUP:	Ages 2-1/2-6 years
SINGLE OR ONE OF A SERIES:	Single
CLASSROOM RUNNING TIME:	Infinite
COMPUTER SYSTEMS:	Commodore 64, Apple II, Atari, IBM
PERIPHERALS REQUIRED:	Joystick
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1984
SOURCE:	Springboard Software (copyright)
AUTHORS:	-
COST ($NZ):	$60 (pre-GST)

Description

Make a Match has four multi-level games designed to help children develop reading readiness skills. Children match and classify objects by shape, colour, and orientation.

Curriculum Applications

The two school teachers described the courseware type as drill and practice, and rated it 'applicable' (rather than 'very applicable') to New Zealand education, with restricted applications to the curriculum. In response to the question on flexibility of use they noted that there are different degrees of difficulty and the courseware allows different learners to be treated in different ways. They thought that no teacher involvement was necessary once the children were initiated, and that the application was suitable for small group or individual use.

They thought there was an appropriate user evaluation component, and appropriate feedback, to the children, that adequate support materials were provided, that the program was 'crash-proof', and that it was possible to make back-up copies of the disk. However, they did not think the courseware

offered an improvement over other teaching methods or a novel teaching/learning opportunity. The contents of the data files could not be teacher-modified. From the teacher's point of view they also commented:

> 'Very good for the younger children because it's simple and reinforces the basic concepts of matching... It doesn't cater for everyone in the class. No reward is offered for correct responses... Found it difficult to locate other games throughout the program. Too difficult for children to do'.
> (Junior School Teachers, 9/6/87).

Children's Motivation

The teachers rated user control of the courseware as limited, and the reading ability required as low for the suggested age level. Looking at the courseware from the children's point of view, they also decided that the directions and screen prompts were clear and consistent. There was a response to inappropriate input ('bounces off', and 'a low buzz' sound), and it assisted appropriately in response to inaccurate input. They evaluated the tone of communications as neutral ('doesn't respond to correct answers'), and the special effects as instructionally functional but of 'little interest'.

The teachers thought the children were not able to review directions if necessary and commented:

> 'We are unsure if (the) program is sticking or if it's just difficult.'

They judged that when and how to respond was always made clear to the user, that the text was presented in brief, easy-to-read blocks, and that diagrams were functional and meaningfully labelled. It seems important to note though, that they thought there was no effective interaction between the courseware and the user, that the courseware was not entirely user friendly, and that the courseware did not always motivate 5 and 6 year old children. They also commented:

> 'It doesn't offer much variety, interest, or motivation. Doesn't offer enough challenge to (children in) our classroom. Doesn't respond to correct answers. May be suitable for pre-schoolers or special learners. The only thing they do is press the space bar when decided'.
> (Junior School teachers, 9/6/87).

When the children were interviewed, none of them mentioned Make a Match as something they liked or disliked about computers.

Corner Store

COURSEWARE TITLE:	Corner Store
SUBJECT:	Mathematics
TOPIC:	Money
INTENDED TARGET GROUP:	Ages 6-10 years
SINGLE OR ONE OF A SERIES:	Single
CLASSROOM RUNNING TIME:	10 minutes
COMPUTER SYSTEM(S):	Commodore 64
PERIPHERALS REQUIRED:	
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1985
SOURCE:	McGraw-Hill (copyright)
AUTHOR(S):	-
COST ($NZ):	$15 (Pre-GST)

Description

The teachers described Corner Store as a closed program that requires the children to choose or type in money values, using the keyboard. If an answer is wrong, the courseware allows a second chance, but if wrong again, the correct answer automatically appears on the screen. Corner Store teaches mathematics/money skills.

Curriculum Applications

The teachers described the courseware type as drill and practice. They rated Corner Store's applicability to New Zealand education as 'applicable with modification', and thought the program had restricted applications to the curriculum. The flexibility of use as 'allows different learners to be treated in different ways'. Little teacher involvement was needed, but they commented 'needs to be supervised'. They saw the application as suitable for individual use.

The teachers thought the courseware did not offer an improvement over other teaching methods or a teaching/learning opportunity which would not otherwise be feasible. They also judged the sequence of presentation, rate of presentation, and degree of difficulty as not appropriate for the intended audience, and they thought the support materials and documentation were not adequate:

> 'Very slow loading program... The money concept is too easy but the instructions are difficult to read. Vice versa, if they can read the instructions then the money addition is too easy'.
> (Junior School teacher, 11/8/87).

The program appeared to be 'crash-proof', but the teachers considered that the contents of the data files could not be teacher-modified.

Children's Motivation

The teachers evaluated user control of the courseware as limited, the reading ability required at the suggested age level as high, and the directions and screen prompts as clear and consistent. They noted that this courseware responds to inappropriate input, and assists appropriately in response to inaccurate input. Looking at Corner Store from the children's point of view, they thought the tone of communications was friendly and the special effects were instructionally functional. They thought the user was not able to review directions if necessary, although when and how to respond was always made clear to the user and the text was presented in brief, easy-to-read blocks. It was possible to turn off non-essential sound effects. The teachers judged that the courseware did not motivate the user, and commented 'slow moving and not very motivating', 'visually unstimulating, off-putting instructions'.

None of the children named Corner Store as something they liked or disliked about computers.

Overall Comment

Although the teachers initially recommended Corner Store as effective and relevant, their overall comments about this courseware seemed less enthusiastic:

> 'Too reliant on teacher or adult supervision. The actual tasks are easy (although abstract) but the instructions are too difficult. The visual aspect is unsuitable for this age group'.
> (Junior School Teachers 11/8/87).

Getting Ready to Read and Add

COURSEWARE TITLE:	Getting Ready to Read and Add
SUBJECT:	Mathematics and language
TOPIC:	Reading, addition
INTENDED TARGET GROUP:	Ages 4 to 8
SINGLE OR ONE OF A SERIES:	Single
CLASSROOM RUNNING TIME:	"Long time to load"
COMPUTER SYSTEM(S):	Commodore 64
PERIPHERALS REQUIRED:	-
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1984
SOURCE:	Sunburst Communications
AUTHOR(S):	M. Kosel and Mitlerman
COST ($NZ):	-

Description

The two school teachers described the courseware in this way:

> "Contains six programs designed to give children practice in discriminating shapes, upper- and lower-case alphabet, letters, and numerals. Knowledge about shapes is acquired along with eye-hand co-ordination."

Curriculum Applications

The teachers rated the courseware type as drill and practice, problem solving, and teacher utility. They evaluated Getting Ready to Read and Add's applications as restricted - to reading and mathematics. As the courseware allowed different learners to be treated in different ways, there was some flexibility of use. They thought that no teacher involvement was needed, and the application was suitable for small group or individual use.

Although they thought the support materials were adequate, the teachers also commented 'too much'. In response to the question 'Is the courseware content accurate, and are the concepts valid and not misleading?' they wrote 'very verbal instructions'. The teachers did not think the courseware offered an improvement over other teacher methods or a learning/teaching opportunity that would not otherwise be feasible. They commented:

'Very basic and easy. Suitable for children who are not very confident with the computer. Matching is the only skill needed, but it does cater for numbers (and) upper and lower case (letters). Inclined to be monotonous for some of the children because of its structured style. A closed program from an education point of view'.
(Junior School teachers, 11/8/87).

Children's Motivation

From the children's point of view, the teachers thought that user control of the courseware was limited, low reading ability was required at the suggested age level, the directions and screen prompts were clear and consistent, and the tone of communications was friendly. They noted that the courseware responded to inappropriate input and assisted minimally in response to inaccurate input. They rated the special effects as instructionally functional, and they responded 'yes' to questions about whether the user is able to review directions if necessary, whether when and how to respond is always made clear to the user, if the diagrams are instructionally functional and meaningfully labelled, if there is effective interaction between the courseware and the user, and if it is possible to turn off non-essential sound effects. The teachers decided that Getting Ready to Read and Add was user friendly and did motivate the user, and commented 'very colourful and motivating for the children'. However, they described this courseware, too, as 'slow moving' and 'time consuming when loading'.

When the children were interviewed post-computer, none of them mentioned Getting Ready to Read and Add as something they liked or disliked about computers.

Overall Comments

The teachers' made this summary statement about the courseware:

'Not really value for money! Limiting for children because there is little variety or motivation. The instruction booklet is very extensive and off-putting really. Jargon could be avoided! The basic instructions could be simplified'.
(Junior School teachers, 11/8/88)

Big Bird's Special Delivery

COURSEWARE TITLE:	Big Bird's Special Delivery
SUBJECT:	Object classification
TOPIC:	Sesame Street
INTENDED TARGET GROUP:	Ages 3-6 years
SINGLE OR ONE OF A SERIES	Series (Sesame Street)
CLASSROOM RUNNING TIME:	Indefinite
COMPUTER SYSTEM(S):	Commodore 64, IBM
PERIPHERALS REQUIRED:	
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1984
SOURCE:	C.B.S. Software (copyright)
AUTHOR(S):	CTW Software group development team
COST ($NZ):	$40-$50 (pre-GST)

Description

Big Bird's Special Delivery has two classification games, with two levels within each game. The first game includes simple classification tasks, for example, 'flower to flower', where a bird carries a flower and the user moves the bird by pressing the < > keys. A person's head gives non-verbal feedback (nodding or shaking). The second game involves matching, for example, musical instruments. More complex concepts are introduced for classification, and Big Bird delivers a parcel for each move.

Curriculum Applications

The kindergarten teachers identified the courseware type as tutorial, drill and practice, problem solving, remedial, and a game. They thought Big Bird's Special Delivery had a variety of applications, and they noted that several different concepts or skills were used. Little teacher involvement was needed, and the application was judged suitable for small group use or individual use.

Although the kindergarten teachers considered that the development of concepts was in line with New Zealand practice and the feedback was appropriate, they commented, 'some Americanization'. They did not think that

the courseware offered an improvement over other teaching methods or a unique teaching/learning opportunity, nor did they believe the courseware would be useful for an audience other than the intended one. The kindergarten teachers agreed that there was an appropriate user evaluation component, and that the program was 'crash-proof'. They found the support materials very adequate, with 'plenty of notes; a card with basic instructions as well as a book'. From the teachers' point of view, they also commented:

> 'Teachers generally felt this program was very Americanized. Loud, gaudy, bright colours, flashy. But we could see definite advantages: children relate readily to Sesame Street characters, excellent matching. Sometimes there is confusion about what to match with what, particularly in the second level where there is general classification e.g. musical instruments - drum to trumpet; clothes - hat to glove etc'.
> (Kindergarten teachers, 9/6/87)

Children's Motivation

The teachers described user control of the courseware as limited. Looking at Big Bird's Special Delivery from the user's point of view, they rated the directions and screen prompts as clear, and noted that the courseware responds to inappropriate input and assists appropriately but with 'loud responses' to inaccurate input. They judged the tone of communications friendly, but commented 'sometimes excessive'. They thought the special effects were decorative only, and responded 'yes' to questions about whether the user is able to review the directions if necessary, if when and how to respond is always made clear to the user, whether the text is presented in brief, easy-to-read blocks, if the diagrams are functional and meaningfully labelled, if there is effective interaction between the courseware and the user, if the courseware can be described as 'user friendly', and if it is possible to turn off non-essential sound effects. The kindergarten teachers thought the courseware could motivate the user, and commented:

> 'Children love the program relating to Sesame Street. Respond to the bright flashy production. (There are) always children waiting to play - they ask for this program. (They) pick the game up easily once shown instructions... (They) mostly play level one, game one.' 'Our most popular program the colourful graphics, colour, and sound plus the fact that it is Sesame Street having a lot to do with it'.
> (Kindergarten teachers, 9/6/87).

The kindergarten children did seem to like Big Bird's Special Delivery. Nine children (18% of the courseware related responses from the kindergarten

sample) named Big Bird's Special Delivery as something they liked about computers. This courseware was the second most popular in terms of the children's responses to interview questions (see Table A.1).

Overall Advantages and Disadvantages

The teachers thought this 'activity' software did help children 'improve their understanding of the attributes of form, class, and function, while having fun'. However, they also described the program as 'closed', involving limited decision making. They found too, that it took a long time to load, 'best to do before the children arrive'. They made this summary statement:

> 'We found the program a little Americanized. The music tends to be noisy, but this does appeal to the children'.
> (Kindergarten Teachers, 9/6/87)

Tally and Total

COURSEWARE TITLE:	Tally and Total
SUBJECT:	Mathematics
TOPIC:	Addition
INTENDED TARGET GROUP:	Ages 4-8 years
SINGLE OR ONE OF A SERIES:	One of a series - ladders to learning.
CLASSROOM RUNNING TIME:	
COMPUTER SYSTEM(S):	Commodore 64
PERIPHERALS REQUIRED:	-
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	
SOURCE:	Successability Software (copyright)
AUTHORS:	McGraw-Hill
COST ($NZ):	"Cheap"

Description

Tally and Total requires simple counting and one-to-one simple addition as pictures appear. There are five levels of difficulty. One level includes tens and units. The school teachers described the flow in this way:

> 'No movement and does not flow. Limited, because there is no way of returning to main menu until the level selected has finished'. (Junior School teachers, 23/4/87)

Curriculum Applications

All teachers described the courseware type as automated text book, drill and practice, and remedial. They rated Tally and Total as applicable with modification to New Zealand education, with restricted curriculum applications. They thought there was some flexibility of use in that the courseware has different degrees of difficulty. Much teacher involvement was needed in both the school and the kindergarten, and the courseware was appropriate for small group use or individual use.

The teachers thought the courseware did not offer an improvement over

other teaching methods nor a teaching/learning opportunity that would not otherwise be feasible. All four teachers thought the rate of presentation was inappropriate for the intended audience, and the teachers commented 'needs more movement'. They also found the feedback inappropriate for the intended audience:

> 'Negative responses to errors'
> (Junior School teachers, 23/4/87)
>
> (The children) do not like the noises made when getting it wrong'.
> (Kindergarten teachers, 23/4/87)

All teachers thought the support materials were not adequate, and the kindergarten teachers described them as 'poor'. They considered the presentation contained sex bias:

> 'Girl offers reinforcement all the time'.
> 'Boys bad, girls good'.

Other negative comments were:

> 'It is recommended for parents to use in association with their child. It is unsuitable for a classroom situation, because it needs adult assistance'.
> (Junior School teachers)
>
> 'Not really suitable for pre-schoolers to use independently... Large amount of reading which is not appropriate at pre-school level. Do not like the responses - condescending and judgemental - this can be off-putting particularly to small children'.
> (Kindergarten teachers)

Children's Motivation

The teachers evaluated user control of the courseware as limited, the reading ability required at the suggested age level as high, and the directions as consistent but 'designed for adults'. Tally and Total responded to inappropriate input with a bad luck sign, a girl's sad face, and a low noise, and assisted appropriately in response to inaccurate input. All of the teachers judged the tone of communications as condescending; they found the user was unable to review directions if necessary, and they expressed some doubt as to whether the courseware was user friendly. They did not think that Tally and Total motivated the children. The school teachers commented, 'very dull, stagnant type of program', and the kindergarten teachers wrote,

'children get frustrated by inflexibility, failure to understand instructions, difficulty in using spacebar to count with'.

None of the children mentioned Tally and Total as something liked or disliked about computers.

Sea Speller

COURSEWARE TITLE:	Sea Speller
SUBJECT:	Reading-Language
TOPIC:	Words
INTENDED TARGET GROUP:	Ages 7-12 years
SINGLE OR ONE OF A SERIES:	Single
CLASSROOM RUNNING TIME:	
COMPUTER SYSTEM(S):	Commodore 64
PERIPHERALS REQUIRED:	Joystick
NUMBER OF DISKS:	One
YEAR OF DEVELOPMENT:	1984
AUTHORS (IF KNOWN):	-
COST ($NZ):	

Description

The school teachers described Sea Speller as a word adventure. The tasks are designed to strengthen spelling and vocabulary skills. For example 'You are the dolphin, one of the fastest swimmers in the sea. Find the missing letters to complete each word on the submarine and help it reach the ocean floor'.

Curriculum Applications

The school teachers identified the courseware type as drill and practice, problem solving, and a game. They thought that, with modification, Sea Speller could be applicable to New Zealand education. They described the courseware as having restricted applications to the curriculum. According to the teachers, Sea Speller allowed different learners to be treated in different ways, needed no teacher involvement, and was suitable for small group or individual use.

The teachers responded negatively to questions about whether the courseware offered an improvement over other teaching methods, if it offered a novel teaching/learning opportunity, if the degree of difficulty was appropriate for the intended audience, and if the contents of the data files can be teacher-modified. However, they responded positively to questions about whether there was a user evaluation component and appropriate feedback, if the courseware would be appropriate for an audience other than the intended one,

if adequate support materials were provided, and if the program was 'crash-proof'. The teachers made these comments:

> 'Sea Speller is a good program in linking word families, but many processes are involved - a) looking at submarine, b) watching score, c) getting letters with joystick.
> Somewhat stilted in catering for more mature children. Does not have any degree of difficulty apart from more difficult words'.
> (Junior School teachers, 11/8/87)

Children's Motivation

From the user's point of view, the teachers thought control of the courseware was limited, average reading ability was needed, and the screen directions were clear and consistent. Sea Speller responded to inappropriate input and assisted minimally in response to inaccurate input. The teachers judged the tone of communications as friendly, the special effects as decorative only, and the courseware as user friendly and motivating for the user. They did think though, that the user was unable to review the directions if necessary, and that some of the outcomes were rather haphazard:

> 'Interesting and motivating program - moving the joystick to pick up letters. Constant moving - too much to see what's going on. A certain amount of guessing. The dolphin moves on regardless of letter chosen'.
> 'Initial appeal because (it's) visually attractive. Very little available to sustain challenge - too monotonous!'

The children did not mention Sea Speller as something they liked or disliked about computers.

Overall Comments

When considering the overall advantages and disadvantages of this 'activity' courseware, the teachers listed a number of disadvantages:

> 'Monotonous. Quick - but (you) don't really know what you're doing! Even though you get it right, the submarine sinks which is supposed to happen, but (it) seems negative. Wrong choice - no points. Children have to think about letters fitting into <u>all</u> three "boxes" rather than just one.'

Their summary statement was:

> 'We can't see a lot of potential. It seems to accept and then reject letters so it's not consistent. We may have a faulty cartridge - but

the ocean floor you (are supposed to) build wasn't seen. - Race against time - which doesn't seem of any consequence to young children. - Not rewarding enough either. Children don't really know (whether) the score is getting bigger or not'.
(Junior School teachers, 11/8/87)

Table A 1

Courseware most frequently named by kindergarten and junior school children as something they liked about computers

Popularity Ranking	Kindergarten Children Courseware Title	N	%[a]	Junior School Children Courseware Title	N	%[b]
1	Facemaker	14	28	Alpha Build	22	42
2	Big Bird's Special Delivery	9	18	Muppet Learning Keys	11	21
3	Early Games	7	14	Sticky Bears	10	19
4	Alpha Build) Sticky Bears) Memory Manor)	5	10	Sticky	4	8

Note:
N = number of times this courseware was named in response to the question, 'What do you like about the computer?' or 'What else do you like about the computer?'

a Total number of responses naming a courseware package, kindergarten children = 51.

b Total number of responses naming a courseware package, junior school children = 52.

OBSERVATION SHEET FOR CHILDREN'S SOCIAL BEHAVIOURS

Exploratory Study in Educational Computing
(Study 9)

Class: _____ No. at the learning centre: _____ Activity/Learning Centre: _____

Child: _____ Boys _____ Girls _____ Observer _____ Date: _____ Time: _____ a.m.

	PROSOCIAL BEHAVIOUR			ANTISOCIAL BEHAVIOUR		NEUTRAL BEHAVIOUR						
Activity	Co-operation/ Helping/ Sharing	Praise	Initiating Social Interaction	Physical/ Verbal Aggression	Non-Verbal/ Object Aggression	Asking Adult for Help	Looking at/ Manipulating Equipment	Verbalization Towards Adults Task	Verbalization Towards Adults Non-task	Verbalization Towards Child Task	Verbalization Towards Child Non-task	Moving/ Attending/ Receiving
Comments: (Problem solving)												
TOTALS												

REVIEW OF EDUCATIONAL COMPUTER COURSEWARE

CCDU

Computer Courseware Development Unit
Curriculum Development Division
Department of Education
New Zealand
1985

COURSEWARE TITLE _____
SUBJECT _____
TOPIC _____
INTENDED TARGET GROUP _____
SINGLE OF ONE OF A SERIES (which?) _____
CLASSROOM RUNNING TIME (approximate, in minutes) _____
COMPUTER SYSTEM(S) _____
PERIPHERALS REQUIRED (e.g. printer, two disk drives) _____
NUMBER OF DISKS _____
YEAR OF DEVELOPMENT _____
SOURCE _____
AUTHOR(S) (if known) _____
COST ($NZ) _____
REVIEWER _____
POSITION _____
DATE OF REVIEW _____

OVERALL RECOMMENDATION	Relatedness to NZ education	Effectiveness
Recommended	☐	☐
Recommended with reservations	☐	☐
Limited value in NZ schools	☐	☐

PHASES OF THE REVIEW

Before completing the review form it is wise to obtain the maximum information about the courseware package by going through the following phases:

PHASE 1 Examine the supplied documentation in order to understand what the courseware is trying to achieve and to note the operating instructions.

PHASE 2 Run the program briefly to obtain a preliminary idea of its content and flow.

PHASE 3 Work through the courseware carefully as would a successful user, avoiding intentional or careless errors. Try to get the most out of the courseware.

PHASE 4 Work through the courseware carefully as would an unsuccessful user, responding incorrectly to see how the courseware handles errors and noting any forms of remediation which it may provide.

PHASE 5 Try to "crash" the program by making ridiculous entries (e.g. letters where numbers are required, overly large numbers, commas in entries, etc.); also try pressing <CTRL C>, <BREAK>, <ESC> and other similar keys at inappropriate places. In addition, try the effect of lower case when upper case is required and vice versa.
Note: If a program "crashes" (i.e., stops execution in situations where the user would not intend this to happen), it is doubtful whether there is any point in proceeding further with the review.

PHASE 6 If possible, field-test the courseware with one or more users who would be typical of the intended target group. Note carefully any difficulties, inconsistencies and areas of confusion which occur. Determine whether or not the courseware achieves its stated aims.

PHASE 7 Complete the report which follows. Note that in some cases it may be appropriate to tick more than one box or perhaps no box at all.

SUPPLIER'S POLICY ON BACKUP DISKS

REVIEW REPORT

BRIEF DESCRIPTION OF COURSEWARE CONTENT AND FLOW

TEACHER'S POINT OF VIEW

(Please tick appropriate boxes and comment wherever necessary)

GENERAL DESCRIPTION OF COURSEWARE TYPE(S)

- automated text book ☐
- tutorial (e.g. programmed learning) ☐
- drill & practice ☐
- simulation ☐
- electronic blackboard ☐
- information retrieval (e.g. data base) ☐
- problem solving ☐
- student or teacher utility (specify) ☐
- remedial ☐
- game ☐
- communication (e.g. electronic mail) ☐
- other (please specify) ☐

APPLICABILITY TO NEW ZEALAND EDUCATION

- very applicable ☐
- applicable with modification ☐
- not applicable ☐
- other (please specify) ☐

CURRICULUM RELATEDNESS (SPECIFY SUBJECT(S))

- variety of applications ☐
- restricted applications ☐

COMPUTER'S ROLE

- tutor of the user ☐
- tool for the user ☐
- tutee for the user ☐

FLEXIBILITY OF USE

- several different concepts or skills ☐
- different degrees of difficulty ☐
- allows different learners to be treated in different ways ☐

LEVEL OF TEACHER INVOLVEMENT ANTICIPATED

- much teacher involvment ☐
- little teacher involvement ☐
- no teacher involvement ☐

APPLICATION IS SUITABLE FOR

- whole class use ☐
- small group use ☐
- inidividual use ☐
- classroom demonstration ☐

	NO	YES	N/A	
Is the development of concepts in line with NZ practice?	☐	☐	☐	
Is the courseware content accurate, and are concepts valid and not misleading?	☐	☐	☐	
Does the courseware offer an improvement over other teaching methods (including use of books and videos)?	☐	☐	☐	
Does the courseware offer a possible teaching/learning opportunity which would not otherwise be feasible?	☐	☐	☐	
Is the sequence of presentation appropriate for the intended audience?	☐	☐	☐	
Is the rate of presentation appropriate for the intended audience?	☐	☐	☐	
Is the degree of difficulty appropriate for the intended audience?	☐	☐	☐	
Is the rate of repetition (e.g., number of examples of a particular type) appropriate for the intended audience?	☐	☐	☐	
Is the feedback appropriate for the intended audience?	☐	☐	☐	
Is there an appropriate user evaluation component?	☐	☐	☐	
Would the courseware be appropriate for an audience other than the intended one?	☐	☐	☐	
Are adequate support materials provided (e.g., documentation, teacher's notes, user's notes, worksheets)?	☐	☐	☐	
Is presentation free of any race or sex bias?	☐	☐	☐	
Is grammatically correct language used?	☐	☐	☐	
If computations are performed, are they error-free?	☐	☐	☐	
Did the program appear to be "crash-proof"? (If "no", what happended?)	☐	☐	☐	
If considered desirable, can the contents of data files be teacher-modified?	☐	☐	☐	
Will the software operate under network conditions?	☐	☐	☐	
Is it possible to make back up copies of the disk?	☐	☐	☐	

Teacher's point of view – other comments

USER S POINT OF VIEW

(Please tick appropriate boxes and comment wherever necessary)

USER CONTROL OF COURSEWARE
- flexible ☐
- limited ☐
- nil ☐

READING ABILITY REQUIRED AT SUGGESTED AGE LEVEL
- high ☐
- average ☐
- low ☐
- controllable ☐

DIRECTIONS AND SCREEN PROMPTS
- clear ☐
- consistent ☐

RESPONSES TO INAPPROPRIATE INPUT
- responds ☐
- ignores ☐
- crashes ☐

RESPONSES TO INACCURATE INPUT
- assists appropriately ☐
- assists minimally ☐
- does not assist ☐

TONE OF COMMUNICATIONS
- friendly ☐
- neutral ☐
- condescending or sarcastic ☐
- undesirable use of jargon ☐

SPECIAL EFFECTS (E G . COLOUR, SOUND, ANIMATION)
- instructionally functional ☐
- decorative only ☐
- distracting ☐

	NO	YES	N/A	
Is user able to review directions if necessary?	☐	☐	☐	
Is when and how to respond always made clear to the user?	☐	☐	☐	
Is text presented in brief, easy-to-read blocks?	☐	☐	☐	
Are diagrams functional and meaningfully labelled?	☐	☐	☐	
Is there effective interaction between the courseware and the user?	☐	☐	☐	
Could the courseware be described as "user friendly"?	☐	☐	☐	
Does the courseware motivate the user?	☐	☐	☐	
Is it possible to turn off non-essential sound effects?	☐	☐	☐	

User s point of view—other comments